United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
Iowa Agriculture and
Home Economics
Experiment Station;
Cooperative Extension
Service, Iowa State
University; and the
Division of Soil
Conservation, Iowa
Department of Agriculture
and Land Stewardship

Soil Survey of Davis County, Iowa

How To Use This Soil Survey

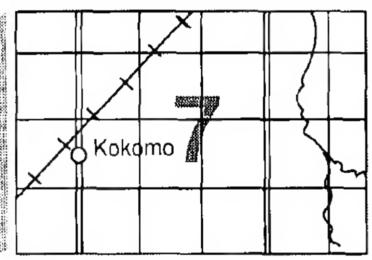
General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

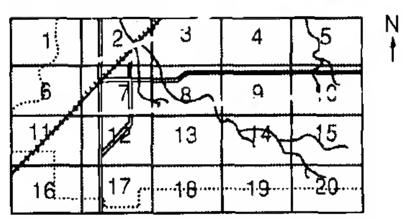
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.



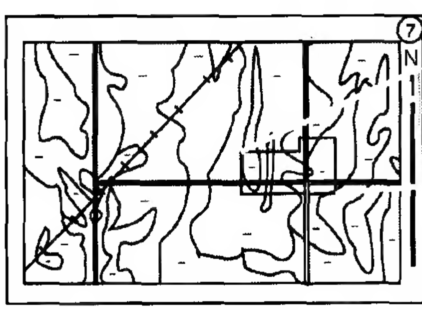
MAP SHEET

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.

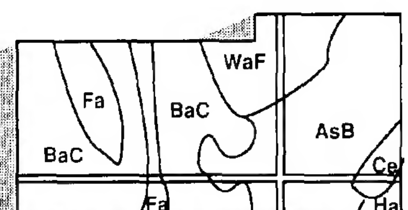


INDEX TO MAP SHEETS

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in the period of 1980-87. Soil names and descriptions were approved in 1987. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1987. This survey was made cooperatively by the Soil Conservation Service; the Iowa Agriculture and Home Economics Experiment Station; the Cooperative Extension Service, Iowa State University; and the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship. It is part of the technical assistance furnished to the Davis County Soil and Water Conservation District. Funds appropriated by Davis County were used to defray part of the cost of the survey.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Soil Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: An area of the Armstrong-Gara-Kniffin association used for permanent pasture and hay.

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Issued May 1991

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Summary of Tables

Preface

This soil survey contains information that can be used in land-planning programs in Davis County, Iowa. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Soil Survey of
Davis County, Iowa

By John A. Lucassen, Soil Conservation Service

Fieldwork by John A. Lucassen, Gary A. Lindgren, Alan A. Belinskas, James E. Seaholm, and Scott C. Killpack, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service,
in cooperation with
Iowa Agriculture and Home Economics Experiment Station; Cooperative Extension Service, Iowa State University; and the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship

General Nature of the County

Davis County is in the southeastern part of Iowa (fig. 1). It has an area of 326,400 acres, or 505 square miles. Bloomfield, the county seat, is in the center of the county. It is about 103 miles southeast of Des Moines.

This survey updates the soil survey of Davis County published in 1940 *(11)*. It provides additional information and larger maps, which show the soils in more detail.

The paragraphs that follow describe the history and development, transportation facilities, drainage, relief, agriculture, and climate of Davis County.

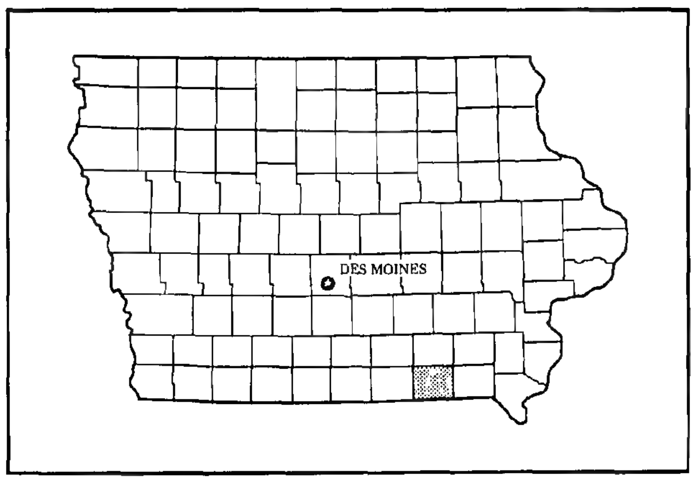

Figure 1.—Location of Davis County in Iowa.

History and Development

The area now known as Davis County was acquired by the United States from France in 1803 as part of the Louisiana Purchase. Until about 1846, it was inhabited by many Indian tribes who were part of two large Indian nations, the Sacs and Foxes and the Iowas. These Indians were first encountered by fur traders. By 1837, the first settlers came from Missouri, Kentucky, Indiana, and southern Illinois and were living along the present southern border of the county near the forks of the Wyaconda River.

Before 1844, Davis County was part of Van Buren County for civil purposes. Public surveys were completed before the county was organized in March 1844 by the Territorial Legislature of Iowa. The county was named after Garrett Davis, a congressman from Kentucky. Bloomfield was named for the large fields of blooming wild flowers in the area where it was established.

Between 1846 and 1860, the Mormons crossed the county while journeying to Utah and established two campsites. In 1909, B.F. Carroll, who was born in the northeastern part of Davis County, became the first Governor of Iowa to have been born in the state.

According to the first census, the population of Davis County was 2,622 in 1844. It increased steadily until around 1900, when it was about 15,620. During this period, the population growth in the county took place in the rural areas. Since the 1900's, the population in the rural areas has declined steadily. The number and population of towns in the county have also decreased since that time. In 1980, the county's population was 9,104, and Bloomfield, the largest town, had a population of 2,849.

Transportation Facilities

Two major highways serve Davis County. U.S. Highway 63, traversing the county dominantly north and south, and Iowa State Highway 2, traversing east and west, intersect at Bloomfield. Iowa State Highway 273 traverses east and west across the northwestern part of the county. Iowa State Highways 202 and 16 cross the extreme southwest and northeast corners of the county respectively. Hard-surface roads connect these highways to other highways and to smaller communities in the county. Nearly all of the farmsteads in Davis County are accessible by roads of crushed limestone.

One railroad line crosses the extreme southwest corner of the county. Bus service and an airport are available at Bloomfield. Motor freight lines serve every trading center in the county.

Drainage

Four major rivers receive almost all of the runoff in Davis County. Nearly 37 percent of the county is drained by the Des Moines River and its smaller tributaries; 23 percent is drained by the North Fabius River and its tributaries; 21 percent is drained by the North and South Wyaconda Rivers and their tributaries; and 19 percent is drained by the Fox River and its tributaries. All of these river systems drain into the Mississippi River.

Soap Creek, Vesser Creek, and Chequest Creek flow east directly into the Des Moines River. North Fabius Creek, Wisdom Creek, and Washington Creek flow east into the North Fabius River, and Carter Creek and Hickory Branch flow into the North Fabius River from the north. North Fox Creek, Center Branch, and South Fox Creek flow into the Fox River. Several small creeks flow south and east into the North and South Wyaconda Rivers.

Relief

The highest elevation in Davis County is about 1,000 feet above sea level. It is about 1 mile east and 1 mile north of the southwest corner of the county. The lowest elevation is about 600 feet above sea level. It is in an area where the Des Moines River leaves Davis County, in the northeast corner of the county.

The difference in elevation between the lowlands and the adjoining uplands ranges from 140 to 200 feet along the Des Moines River and its tributaries in the northern part of the county. It ranges from 50 to 120 feet in the other drainage areas in the county. Surface elevation gradually increases in a southwesterly direction across the county.

Along Soap and Chequest Creeks, the landscape is characterized by gently rolling to very steep slopes. Near the other drainage systems in the county, it is characterized by rolling to steep slopes. The broad areas between the major streams, especially in the north-central and southern parts of the county, are nearly level and undulating.

Agriculture

Agriculture is the chief economic enterprise in Davis County. It provides a livelihood for farmers as well as for those engaged in business, professions, finance, and related agribusiness activities. The local income is derived mostly from farm products, including dairy cows, feeder cattle, beef cows, hogs, and sheep. Davis County is near the top of the statewide rankings in the number of sheep raised and marketed.

Beef cattle, hogs, and sheep are the most extensively raised livestock in the county. In 1986, about 2,500 grain-fed cattle, 59,000 hogs, and 7,700 grain-fed sheep were marketed *(21)*.

In 1986, crops were harvested on about 46 percent of the acreage in the county *(21)*. They included corn, soybeans, oats, hay, and wheat. About 12 percent of the county is pasture-timber, and 17 percent is pasture. Timbered areas make up about 4 percent of the county. The rest of the county is land set aside by the government, idle land, commercial-industrial, or residential land.

The farms in Davis County have been increasing in size and decreasing in number. In 1986, the average-size farm was 338 acres, and the number of farms was 920 *(21)*.

Climate

Prepared by the National Climatic Data Center, Asheville, North Carolina.

Davis County is cold in winter and quite hot in summer. Occasional cool spells occur in summer. Precipitation during the winter frequently occurs as snowstorms. During the warm months, when warm, moist air moves in from the south, the precipitation occurs mainly as showers, which are often heavy. The total annual rainfall is normally adequate for corn, soybeans, and small grain.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Bloomfield in the period 1951 to 1984. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 26 degrees F and the average daily minimum temperature is 16 degrees. The lowest temperature on record, which occurred at Bloomfield on January 12, 1974, is -29 degrees. In summer, the average temperature is 74 degrees and the average daily maximum temperature is 85 degrees. The highest recorded temperature, which occurred on July 27, 1956, is 107 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 37 inches. Of this, 25 inches, or about 68 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 20 inches. The heaviest 1-day rainfall during the period of record was 5.29 inches at Bloomfield on July 4, 1974. Thunderstorms occur on about 50 days each year.

The average seasonal snowfall is about 30 inches. The greatest snow depth at any one time during the period of record was 24 inches. On the average, 30 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the northwest. Average windspeed is highest, 13 miles per hour, in spring.

Tornadoes and severe thunderstorms strike occasionally. These storms are local in extent and of short duration and result in sparse damage in narrow belts. Hailstorms at times occur in scattered small areas during the warmer part of the year in irregular patterns and in relatively small areas.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil

profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

1. Edina-Seymour-Clarinda Association

Nearly level to moderately sloping, poorly drained and somewhat poorly drained, silty soils that formed in loess and a paleosol weathered from glacial till; on uplands

This association consists of soils on narrow and broad flats and dissected side slopes. The landscape is level to gently rolling. Slopes range from 0 to 9 percent.

This association makes up about 19 percent of the county. It is about 36 percent Edina soils, 32 percent Seymour soils, 23 percent Clarinda soils, and 9 percent soils of minor extent (fig. 2).

Edina soils are poorly drained and are on narrow and broad flats. Seymour soils are somewhat poorly drained and are on convex side slopes and the upper side slopes bordering broad upland flats. Clarinda soils are poorly drained and are on the convex side slopes of the coves at the upper ends of drainageways.

Typically, the surface layer of the Edina soils is very dark gray silt loam about 9 inches thick. The subsurface layer is dark gray silt loam about 11 inches thick. The subsoil is about 29 inches thick. It is mottled. The upper part is very dark gray and dark gray, very firm silty clay; the next part is grayish brown, very firm silty clay; and the lower part is olive gray, firm and friable silty clay and silty clay loam. The substratum to a depth of about 60 inches is olive gray, mottled silty clay loam.

Typically, the surface layer of the Seymour soils is very dark gray silt loam about 8 inches thick. The subsurface layer is very dark gray silty clay loam about 8 inches thick. The subsoil extends to a depth of about 60 inches. The upper part is dark grayish brown, mottled, very firm silty clay; the next part is grayish brown, mottled, very firm silty clay and silty clay loam; and the lower part is light olive gray, mottled, friable silty clay loam.

Typically, the surface layer of the Clarinda soils is very dark gray silty clay loam about 6 inches thick. It is mixed with some streaks and pockets of dark gray subsoil material. The subsoil to a depth of about 60 inches is firm and very firm and is mottled. The upper part is dark gray silty clay, the next part is gray silty clay, and the lower part is gray clay.

Minor in this association are the Adair, Kniffin, Lamoni, Olmitz, and Shelby soils. Adair and Lamoni soils formed in a paleosol weathered from glacial till. They are on convex ridgetops and side slopes downslope from and adjacent to the Clarinda soils. Kniffin soils have a surface layer that is thinner and lighter colored than that of the Seymour soils. Olmitz soils formed in alluvium along upland drainageways. Shelby soils formed in glacial till on the more sloping side slopes downslope from the Clarinda soils.

The nearly level and gently sloping upland soils are used for cultivated crops. The moderately sloping to moderately steep soils are used for permanent pasture, hay, or cultivated crops. The main enterprises are growing cash-grain crops and raising livestock.

The nearly level and gently sloping soils in this association are moderately suited to corn, soybeans, oats, and hay. The moderately sloping soils are poorly

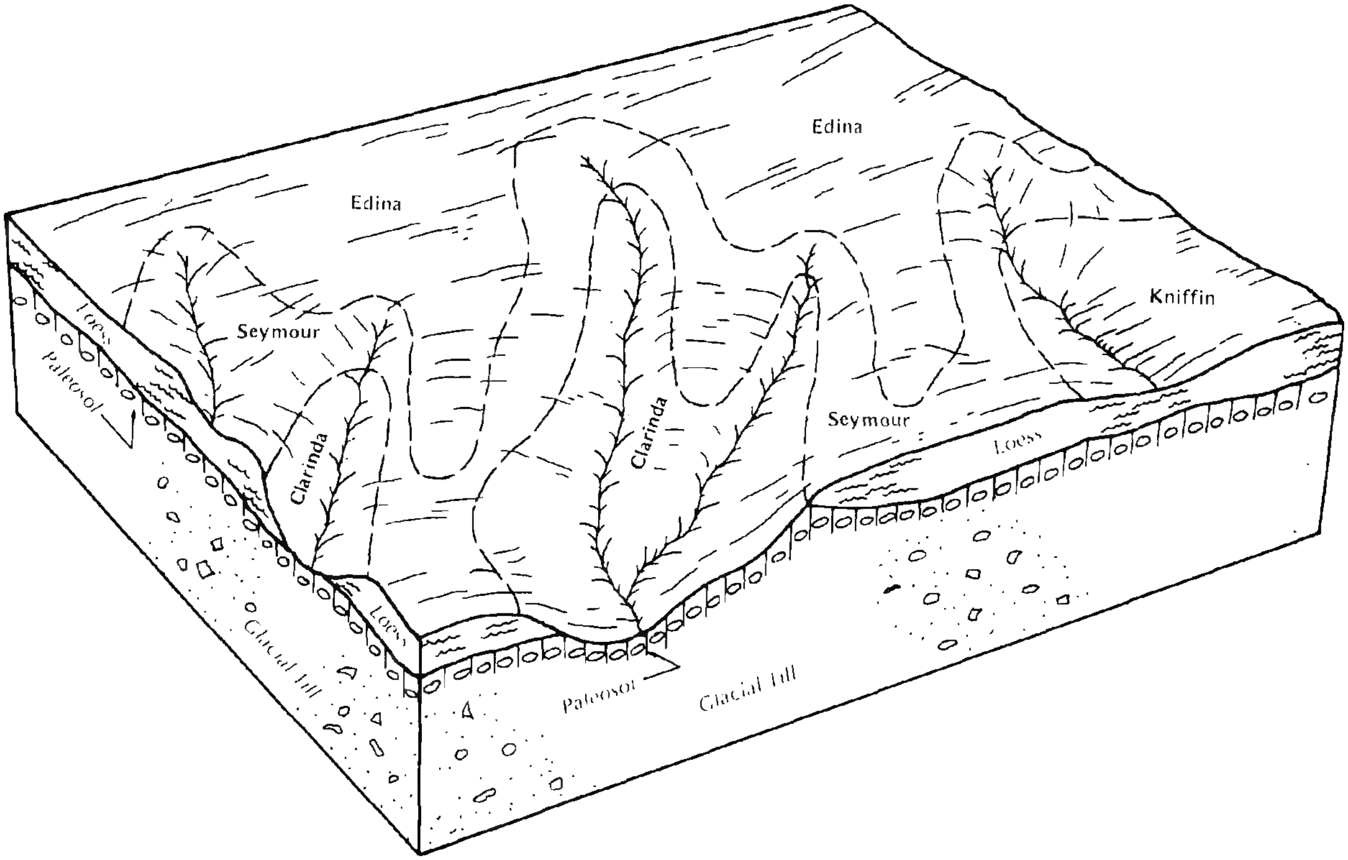

Figure 2.—Typical pattern of soils and parent material in the Edina-Seymour-Clarinda association.

suited to all of these crops, except for hay. Available water capacity is high or moderate in the major soils. Organic matter content is moderate. The main management concerns are removing excess surface water, controlling erosion, preventing the formation of gullies, and maintaining fertility.

2. Armstrong-Gara-Kniffin Association

Gently sloping to steep, somewhat poorly drained to well drained, loamy and silty soils that formed in a paleosol weathered from glacial till and in glacial till and loess; on uplands

This association consists of soils on dissected, convex side slopes and long, narrow, convex ridgetops. The landscape is undulating to steep. Slopes range from 2 to 25 percent.

This association makes up about 46 percent of the county. It is about 25 percent Armstrong and similar soils, 24 percent Gara and similar soils, 16 percent Kniffin and similar soils, and 35 percent soils of minor extent (fig. 3).

Armstrong soils are moderately well drained and somewhat poorly drained and are on narrow, convex ridgetops and the upper side slopes. Gara soils are well drained and are on convex side slopes. Kniffin soils are somewhat poorly drained and are on convex ridgetops and the upper side slopes bordering stable upland flats.

Typically, the surface layer of the Armstrong soils is very dark grayish brown loam about 7 inches thick. It is mixed with streaks and pockets of brown subsoil material. The subsoil is about 42 inches thick. The upper part is brown, mottled, very firm clay, and the lower part is yellowish brown, firm clay loam that has red mottles. The substratum to a depth of about 60 inches is yellowish brown, mottled loam.

Typically, the surface layer of the Gara soils is very dark grayish brown loam about 7 inches thick. It is

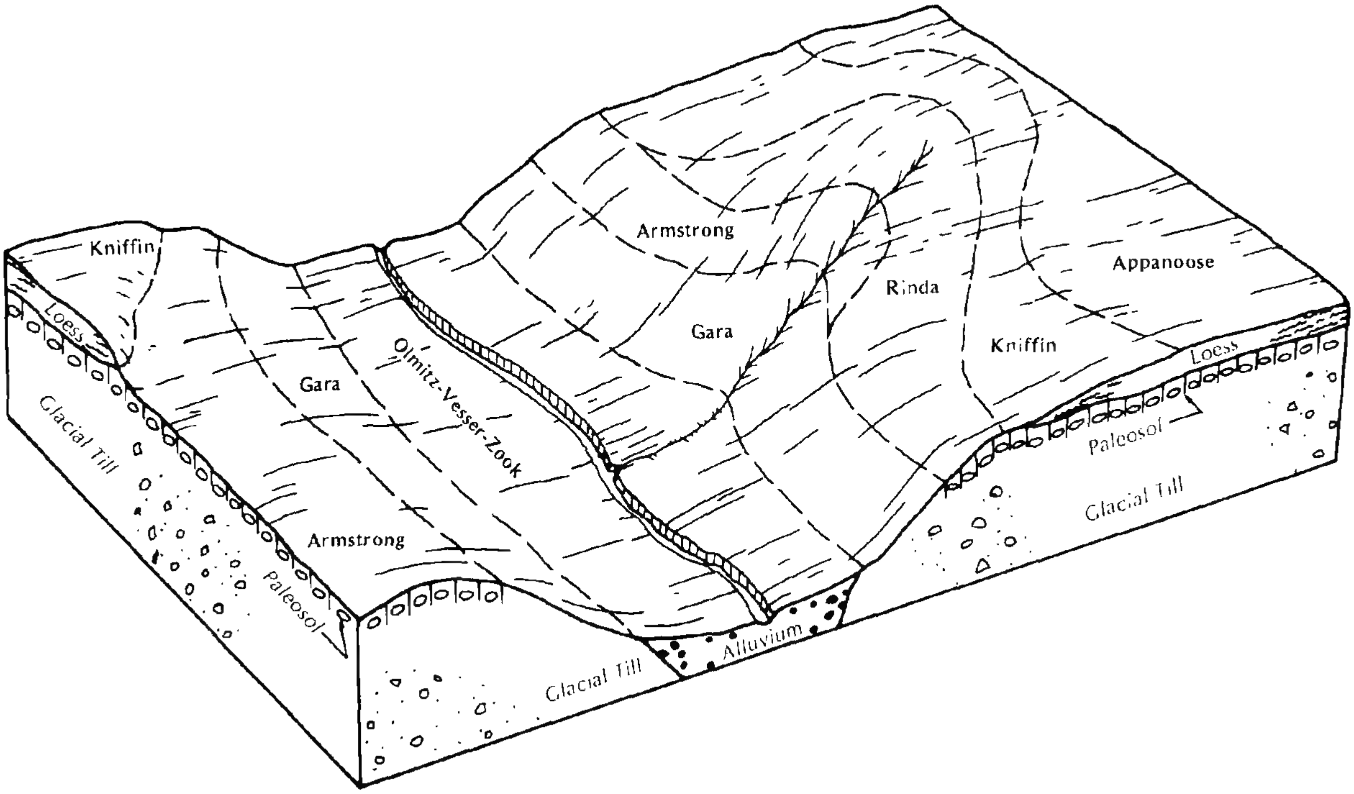

Figure 3.—Typical pattern of soils and parent material in the Armstrong-Gara-Kniffin association.

mixed with streaks and pockets of brown subsurface material. The subsoil is clay loam about 33 inches thick. The upper part is dark yellowish brown and friable, the next part is dark yellowish brown and firm, and the lower part is yellowish brown, mottled, and firm. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Typically, the surface layer of the Kniffin soils is very dark gray silt loam about 8 inches thick. The subsurface layer is dark grayish brown silty clay loam about 3 inches thick. The subsoil extends to a depth of about 60 inches. The upper part is dark grayish brown, firm and very firm silty clay; the next part is olive gray, firm silty clay loam; and the lower part is light olive gray, firm and friable silty clay loam.

Minor in this association are the Appanoose, Olmitz, Rinda, Vesser, and Zook soils. Appanoose soils are poorly drained and nearly level and are on divides. Olmitz soils formed in loamy alluvium on foot slopes. They have a thick, dark surface soil. Rinda soils formed in a gray, clayey paleosol weathered from glacial till. They are in upland coves and on side slopes upslope from the Gara soils. Vesser and Zook soils formed in silty alluvium on bottom land.

The nearly level to moderately sloping upland soils are used for cultivated crops or hay. The strongly sloping to steep soils are used for permanent pasture, hay, or wildlife habitat. Many ponds are in the steep areas. They help to control erosion and provide water for livestock. The minor soils on bottom land are used for cultivated crops, hay, or permanent pasture, depending on the width of the bottom land and the extent to which the stream channels meander. The main enterprises are growing cash-grain crops and raising livestock.

The gently sloping and moderately sloping soils in this association are moderately well suited to corn, soybeans, oats, and hay. The strongly sloping to steep soils are moderately suited to hay and permanent pasture. Available water capacity is high or moderate in the major soils. Organic matter content is moderately low or moderate. The main management concerns are controlling erosion, preventing the formation of gullies, and maintaining fertility.

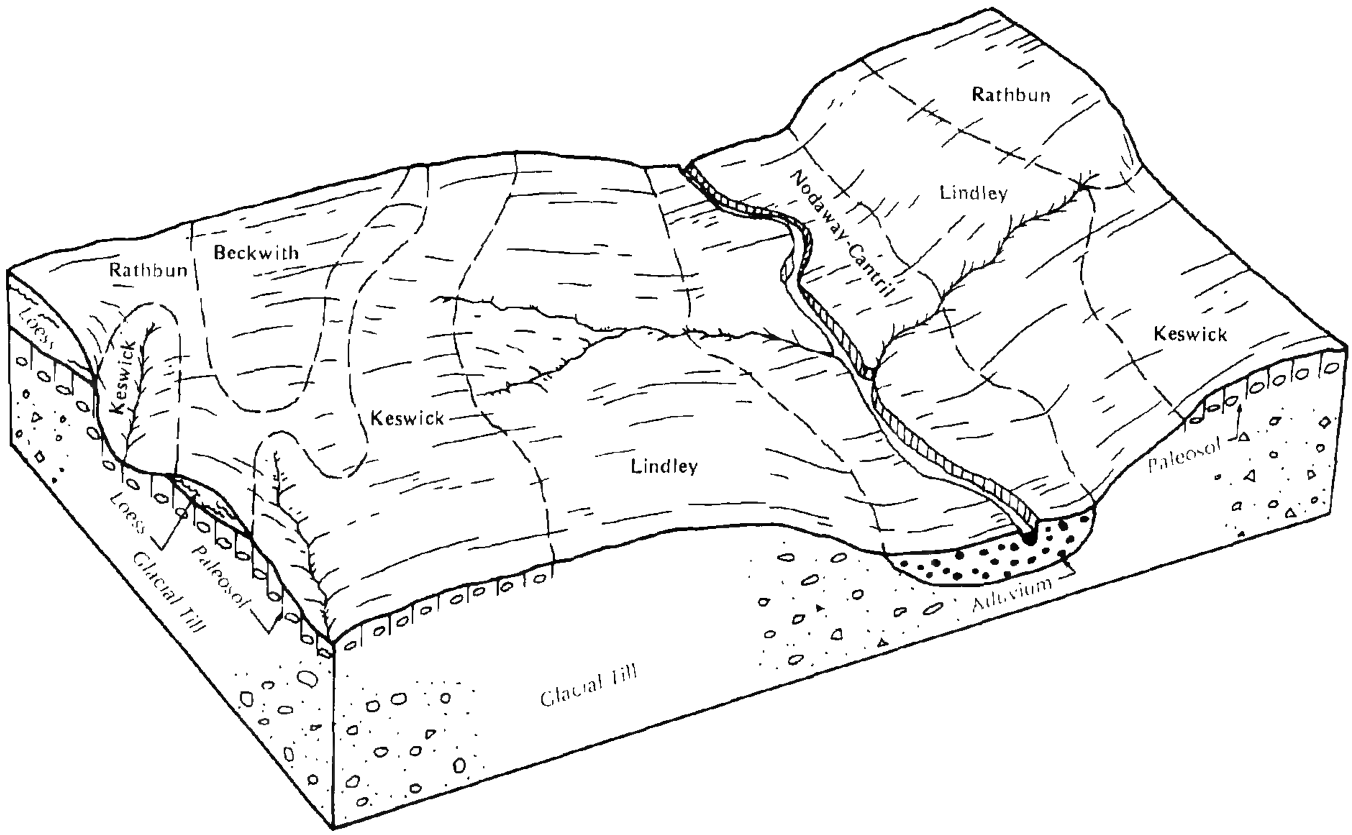

Figure 4.—Typical pattern of soils and parent material in the Lindley-Keswick-Rathbun association.

3. Lindley-Keswick-Rathbun Association

Gently sloping to very steep, well drained to somewhat poorly drained, loamy and silty soils that formed in glacial till, a paleosol weathered from glacial till, and loess; on uplands

This association consists of soils on dissected, convex side slopes and long, narrow, convex ridgetops. The landscape is undulating to very steep. Slopes range from 2 to 40 percent.

This association makes up about 6 percent of the county. It is about 38 percent Lindley soils, 26 percent Keswick soils, 10 percent Rathbun soils, and 26 percent soils of minor extent (fig. 4).

Lindley soils are well drained and are on convex side slopes. Keswick soils are moderately well drained and are on narrow, convex ridgetops and the upper side slopes. Rathbun soils are somewhat poorly drained and are on narrow, convex ridgetops and the upper side slopes.

Typically, the surface layer of the Lindley soils is very dark grayish brown and dark grayish brown loam about 3 inches thick. The subsurface layer is brown and yellowish brown loam about 5 inches thick. The subsoil is clay loam about 36 inches thick. It is yellowish brown and friable in the upper part and yellowish brown, mottled, and firm in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Typically, the surface layer of the Keswick soils is dark grayish brown loam about 6 inches thick. It is mixed with streaks and pockets of reddish brown and brown subsurface and subsoil material. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is reddish brown and brown, firm clay loam; the next part is yellowish red and brown, very firm clay; and the lower part is strong brown, yellowish brown, and grayish brown, firm clay loam.

Typically, the surface layer of the Rathbun soils is brown silty clay loam about 6 inches thick. It is mixed with streaks and pockets of yellowish brown subsoil material. The subsoil is about 45 inches thick. The

upper part is dark grayish brown and yellowish brown, very firm silty clay; the next part is grayish brown, firm silty clay; and the lower part is light brownish gray, firm and friable silty clay loam. The substratum to a depth of about 60 inches is light brownish gray silt loam.

Minor in this association are the Beckwith, Cantril, Douds, Galland, and Nodaway soils. Beckwith soils are poorly drained, very slowly permeable, and nearly level. They are on divides. Cantril soils formed in loamy alluvium on foot slopes adjacent to the Lindley soils. Douds and Galland soils formed in silty alluvium on gently sloping, narrow bottom land and along upland drainageways.

The nearly level to moderately sloping upland soils are used for cultivated crops, hay, or permanent pasture. The moderately sloping to very steep soils are used for permanent pasture, woodland, or wildlife habitat. Many ponds are in the steep areas. They help to control erosion and provide water for livestock. The minor soils on bottom land are used for cultivated crops, hay, permanent pasture, woodland, or wildlife habitat, depending on the width of the bottom land and the extent to which the stream channels meander. The main enterprises are growing hay, raising livestock, and logging.

The nearly level and moderately sloping soils in this association are moderately suited to corn, soybeans, oats, and hay. The strongly sloping and moderately steep soils are moderately suited to hay and permanent pasture. Available water capacity is high or moderate in the major soils. Organic matter content is low to moderate. The main management concerns are controlling erosion, preventing the formation of gullies, and maintaining fertility.

4. Gara-Armstrong-Pershing Association

Gently sloping to steep, well drained to somewhat poorly drained, loamy and silty soils that formed in glacial till, a paleosol weathered from glacial till, and loess; on uplands

This association consists of soils on long and narrow, convex ridgetops and dissected side slopes. The landscape is undulating to steep. Slopes range from 2 to 25 percent.

This association makes up about 6 percent of the county. It is about 27 percent Gara and similar soils, 24 percent Armstrong and similar soils, 20 percent Pershing and similar soils, and 29 percent soils of minor extent.

Gara soils are well drained and are on convex side slopes. Armstrong soils are moderately well drained and somewhat poorly drained and are on narrow, convex ridgetops and the upper side slopes. Pershing soils are moderately well drained and somewhat poorly drained and are on convex ridgetops and the upper side slopes that border stable upland flats.

Typically, the surface layer of the Gara soils is very dark grayish brown loam about 7 inches thick. It is mixed with streaks and pockets of brown subsurface material. The subsoil is clay loam about 33 inches thick. The upper part is dark yellowish brown and friable, the next part is dark yellowish brown and firm, and the lower part is yellowish brown, mottled, and firm. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Typically, the surface layer of the Armstrong soils is very dark grayish brown loam about 7 inches thick. It is mixed with streaks and pockets of brown subsoil material. The subsoil is about 42 inches thick. The upper part is brown, mottled, very firm clay, and the lower part is yellowish brown, firm clay loam that has red mottles. The substratum to a depth of about 60 inches is yellowish brown, mottled loam.

Typically, the surface layer of the Pershing soils is very dark gray silt loam about 8 inches thick. The subsurface layer is dark grayish brown silt loam about 3 inches thick. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is brown and dark grayish brown, friable silty clay loam; the next part is grayish brown, firm silty clay; and the lower part is light brownish gray and light olive gray, firm and friable silty clay loam.

Minor in this association are the Bucknell, Olmitz, Rinda, Vesser, and Zook soils. Bucknell and Rinda soils formed in a gray and grayish brown, clayey paleosol weathered from glacial till. Olmitz soils formed in loamy alluvium on foot slopes. They have a dark surface soil. Vesser and Zook soils formed in silty alluvium along narrow upland drainageways and on bottom land.

The nearly level to moderately sloping upland soils are used for hay or cultivated crops. The strongly sloping to steep soils are used for permanent pasture, hay, or wildlife habitat. Many ponds are in the steep areas. They help to control erosion and provide water for livestock. The minor soils on bottom land are used for cultivated crops, hay, or pasture, depending on the width of the bottom land and the extent to which the stream channels meander. The main enterprises are growing cash-grain crops and raising livestock.

The gently sloping and moderately sloping soils in this association are moderately well suited to corn, soybeans, oats, and hay. The strongly sloping to steep soils are moderately suited to hay, wildlife habitat, and

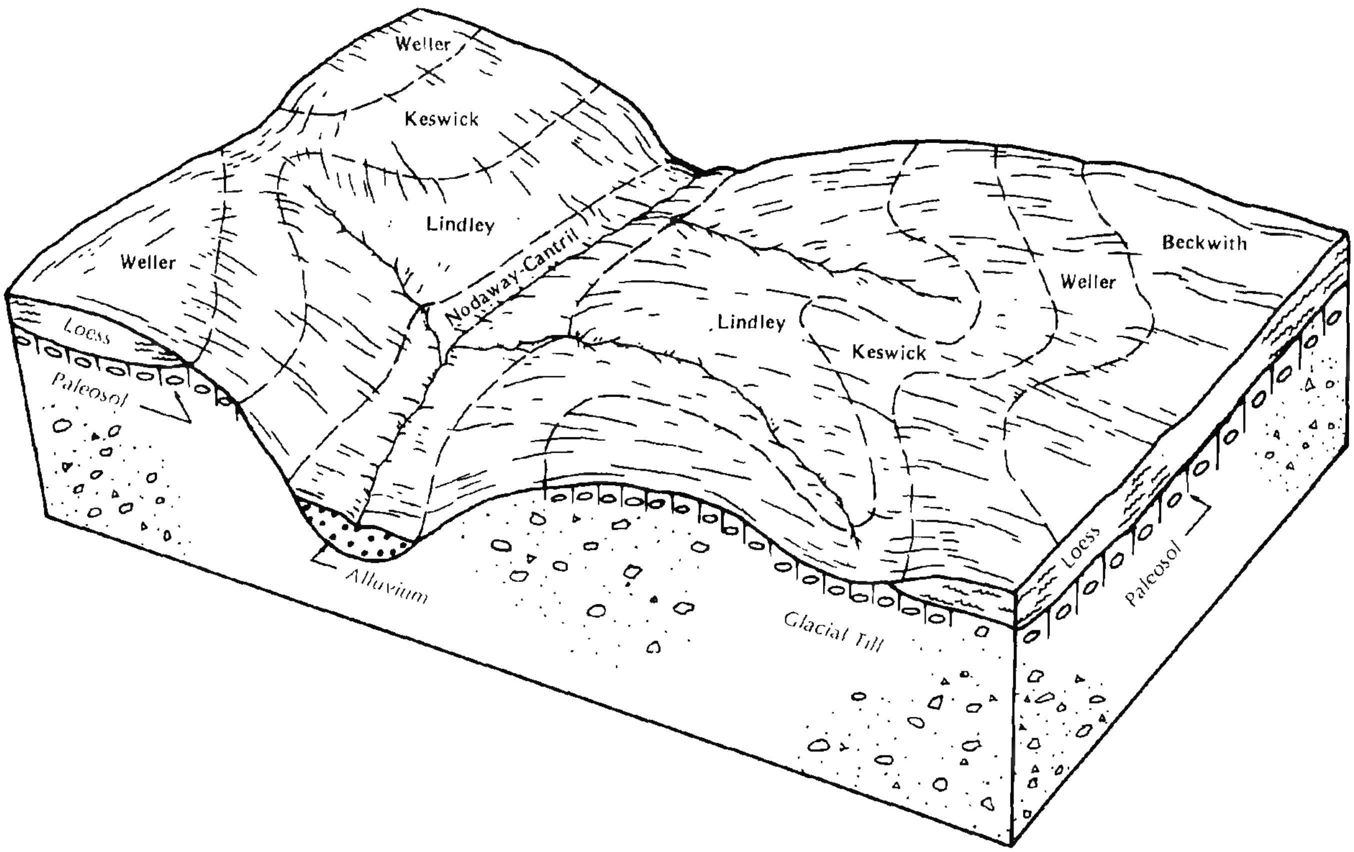

Figure 5.—Typical pattern of soils and parent material in the Lindley-Keswick-Weller association.

permanent pasture. Available water capacity is high or moderate in the major soils. Organic matter content is moderately low or moderate. The main management concerns are controlling erosion, preventing the formation of gullies, and maintaining fertility.

5. Lindley-Keswick-Weller Association

Gently sloping to very steep, well drained and moderately well drained, loamy and silty soils that formed in glacial till, a paleosol weathered from glacial till, and loess; on uplands

This association consists of soils on dissected, convex side slopes and long, narrow, convex ridgetops. The landscape is undulating to very steep. Slopes range from 2 to 40 percent.

This association makes up about 14 percent of the county. It is about 38 percent Lindley soils, 26 percent Keswick soils, 12 percent Weller soils, and 24 percent soils of minor extent (fig. 5).

Lindley soils are well drained and are on convex side slopes. Keswick soils are moderately well drained and are on narrow, convex ridgetops and the upper side slopes. Weller soils are moderately well drained and are on narrow, convex ridgetops and the upper side slopes.

Typically, the surface layer of the Lindley soils is very dark grayish brown loam about 3 inches thick. The subsurface layer is brown and yellowish brown loam about 5 inches thick. The subsoil is yellowish brown clay loam about 36 inches thick. It is friable in the upper part and mottled and firm in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Typically, the surface layer of the Keswick soils is dark grayish brown loam about 6 inches thick. It is mixed with streaks and pockets of reddish brown and brown subsurface and subsoil material. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is reddish brown and brown, firm clay loam; the next part is yellowish red and brown, very firm clay;

and the lower part is strong brown, yellowish brown, and grayish brown, firm clay loam.

Typically, the surface layer of the Weller soils is brown silty clay loam about 6 inches thick. It is mixed with streaks and pockets of yellowish brown subsoil material. The subsoil is about 50 inches thick. It is mottled. The upper part is yellowish brown, friable and firm silty clay loam; the next part is yellowish brown and grayish brown, firm silty clay; and the lower part is grayish brown and yellowish brown, firm silty clay loam. The substratum to a depth of about 60 inches is light brownish gray, mottled silty clay loam.

Minor in this association are the Beckwith, Cantril, Douds, Galland, and Nodaway soils. Beckwith soils are poorly drained, very slowly permeable, and nearly level. They are on divides. Cantril soils formed in loamy alluvium on foot slopes adjacent to the Lindley soils. Douds and Galland soils formed in alluvium on high terraces adjacent to the major streams. Nodaway soils formed in silty alluvium on gently sloping, narrow bottom land and along upland drainageways.

The nearly level upland soils are used for cultivated crops, hay, or permanent pasture. The moderately sloping to very steep soils are used for permanent pasture, woodland, or wildlife habitat. Many ponds are in the steep areas. They help to control erosion and provide water for livestock. The minor soils on bottom land are used for cultivated crops, hay, permanent pasture, woodland, or wildlife habitat, depending on the width of the bottom land and the extent to which the stream channels meander. The main enterprises are growing hay, raising livestock, and logging.

The nearly level to moderately sloping soils in this association are moderately suited to corn, soybeans, oats, and hay. The strongly sloping and moderately steep soils are moderately suited to hay and permanent pasture. Available water capacity is high or moderate in the major soils. Organic matter content is low or moderate. The main management concerns are controlling erosion, preventing the formation of gullies, and maintaining fertility.

6. Lindley-Clinton Association

Gently sloping to very steep, well drained and moderately well drained, loamy and silty soils that formed in glacial till and loess; on uplands

This association consists of soils on dissected, convex side slopes and long, narrow, convex ridgetops. The landscape is undulating to very steep. Slopes range from 2 to 40 percent.

This association makes up about 2 percent of the county. It is about 38 percent Lindley soils, 32 percent Clinton soils, and 30 percent soils of minor extent.

Lindley soils are well drained and are on convex side slopes. Clinton soils are moderately well drained and are on narrow, convex ridgetops and the upper side slopes.

Typically, the surface layer of the Lindley soils is very dark grayish brown loam about 3 inches thick. The subsurface layer is brown and yellowish brown loam about 5 inches thick. The subsoil is yellowish brown clay loam about 36 inches thick. It is friable in the upper part and mottled and firm in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Typically, the surface layer of the Clinton soils is brown silt loam about 6 inches thick. It is mixed with streaks and pockets of yellowish brown subsoil material. The subsoil to a depth of about 60 inches is firm silty clay loam. The upper part is yellowish brown and dark yellowish brown, the next part is brown, and the lower part is yellowish brown.

Minor in this association are the Cantril, Gosport, Keswick, and Nodaway soils. Cantril soils formed in loamy alluvium on foot slopes adjacent to the Lindley soils. Gosport soils formed in acid shale residuum on the lower parts of side slopes along the major streams. Keswick soils formed in a reddish brown, clay loam paleosol that weathered from glacial till. Nodaway soils formed in silty alluvium on gently sloping, narrow bottom land and in upland drainageways.

The gently sloping and moderately sloping upland soils are used for uncultivated crops, hay, or permanent pasture. The strongly sloping to very steep soils are used for permanent pasture, woodland, or wildlife habitat. Many ponds are in the steep areas. They help to control erosion and provide water for livestock. The minor soils on bottom land are used for cultivated crops, hay, permanent pasture, woodland, or wildlife habitat, depending on the width of the bottom land and the extent to which the stream channels meander. The main enterprises are growing hay, raising livestock, and logging.

The gently sloping and moderately sloping soils in this association are moderately suited to corn, soybeans, oats, and hay. The strongly sloping and moderately steep soils are moderately suited to hay and permanent pasture. Available water capacity is high or moderate in the major soils. Organic matter content is low to moderate. The main management concerns are controlling erosion, preventing the formation of gullies, and maintaining fertility.

7. Nodaway-Vesser-Zook Association

Nearly level to gently sloping, moderately well drained and poorly drained, silty soils that formed in alluvium; on bottom land

This association consists of soils on alluvial fans and bottom land along the major streams. These soils are subject to flooding. The landscape is nearly level and undulating. Slopes range from 0 to 5 percent.

This association makes up about 7 percent of the county. It is about 37 percent Nodaway and similar soils, 33 percent Vesser and similar soils, 12 percent Zook soils, and 18 percent soils of minor extent.

Nodaway soils are moderately well drained and are on bottom land adjacent to the stream channels. Vesser and Zook soils are poorly drained and are on alluvial fans and the slightly higher second levels of the bottom land.

Typically, the surface layer of the Nodaway soils is very dark grayish brown silt loam about 8 inches thick. The substratum to a depth of about 60 inches is stratified dark grayish brown, dark brown, grayish brown, and brown silt loam.

Typically, the surface layer of the Vesser soils is very dark gray silt loam about 9 inches thick. The subsurface layer is very dark gray and dark gray silt loam about 28 inches thick. It is mottled in the lower part. The subsoil to a depth of about 60 inches is gray, dark gray, and very dark gray, mottled, firm silty clay loam.

Typically, the surface layer of the Zook soils is black silty clay loam about 9 inches thick. The subsurface layer is about 21 inches of black and very dark gray silty clay. The subsoil is about 13 inches of very dark gray, friable silty clay and dark gray, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is dark gray, mottled silty clay loam.

Minor in this association are the Humeston, Okaw, and Tuskeego soils. These soils are in landscape positions similar to those of the Zook soils. They are grayer below the surface layer than the Zook soils and contain more clay in the subsoil than the Vesser and Nodaway soils. Unlike the Nodaway soils, they are not stratified.

The nearly level and very gently sloping soils on bottom land are used for cultivated crops or hay. Areas that have meandering stream channels and narrow stream valleys are used for pasture or wildlife habitat or are left idle. The main enterprise is growing cash-grain crops.

The soils in this association are well suited to corn, soybeans, oats, and hay if they are adequately drained and protected from flooding. Available water capacity is high in the major soils. Organic matter content is moderately low or moderate. The main management needs are measures that protect the soils from floodwater, improve drainage, and maintain fertility. The soils can be drained by tile and surface drains if adequate outlets are available. Diversions and channel improvement help to control floodwater and runoff from the adjacent areas.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Weller silt loam, 2 to 5 percent slopes, is a phase of the Weller series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Nodaway-Cantril complex, 0 to 5 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, sand and gravel, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

13B—Olmitz-Vesser-Zook complex, 0 to 5 percent slopes. These gently sloping soils are in narrow drainageways and on narrow foot slopes. The moderately well drained Olmitz and poorly drained Vesser soils are on the upper parts of the slopes. The poorly drained Zook soil is on the lower parts, near the stream channels. The Zook and Vesser soils are subject to flooding. Areas are long and narrow and range from 10 to more than 100 acres in size. They are about 35 percent Olmitz soil, 30 percent Vesser soil, and 20 percent Zook soil. The three soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Olmitz soil is black loam about 10 inches thick. The subsurface layer is about 20 inches of black loam and very dark grayish brown clay loam. The subsoil to a depth of about 60 inches is mottled, friable clay loam. The upper part is dark brown, and the lower part is brown.

Typically, the surface layer of the Vesser soil is very dark gray silt loam about 9 inches thick. The subsurface layer is very dark gray and dark gray silt loam about 28 inches thick. It is mottled in the lower part. The subsoil to a depth of about 60 inches is gray, dark gray, and very dark gray, mottled, firm silty clay loam.

Typically, the surface layer of the Zook soil is black silty clay loam about 9 inches thick. The subsurface layer is about 21 inches of black and very dark gray silty clay loam and silty clay. The subsoil is about 13 inches of very dark gray and dark gray, mottled, firm silty clay and silty clay loam. The substratum to a depth of about 60 inches is dark gray, mottled silty clay loam.

Included with these soils in mapping are small areas of Humeston, Nodaway, and Tuskeego soils. Humeston and Tuskeego soils are in areas near the Vesser soil. They contain more clay than the Vesser soil. Also, Tuskeego soils contain less organic matter. Nodaway soils contain less clay and less organic matter than the Zook soil. They are in areas near the Zook soil. Included soils make up about 15 percent of the unit.

The Olmitz and Vesser soils are moderately permeable, and the Zook soil is slowly permeable. The available water capacity is high in all three soils, and runoff is slow or medium. The Vesser and Zook soils have a seasonal high water table. The shrink-swell potential is high in the Zook soil. The content of organic matter in the surface layer of the Olmitz and Vesser soils is about 3 to 4 percent, and that in the surface layer of the Zook soil is about 5 to 7 percent. The subsoil of the Olmitz soil is very low in content of available phosphorus and potassium. The subsoil of the Vesser soil is medium in content of available phosphorus and low in content of available potassium. The subsoil of the Zook soil is low in content of available phosphorus and very low in content of available potassium.

Many areas are cultivated. Some are used for hay, pasture, woodland, or wildlife habitat. These soils are moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Row crops can be grown in many years if the soils are drained and protected from floodwater. A subsurface drainage system is needed. In many areas diversion terraces are needed to protect the soils from the runoff from the higher surrounding areas. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition. Interseeding the grasses and legumes into the existing sod eliminates the need for plowing when a seedbed is prepared.

The land capability classification is IIIw.

24D2—Shelby loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained soil is on convex side slopes and narrow ridgetops in the uplands. Areas are long and narrow or irregularly shaped and range from 5 to 15 acres in size.

Typically, the surface layer is very dark gray loam about 9 inches thick. It is mixed with streaks and pockets of yellowish brown subsoil material. The subsoil is about 41 inches of yellowish brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown loam.

Included with this soil in mapping are small areas of Adair and Lamoni soils. These soils are higher on the landscape than the Shelby soil and have more clay in the subsoil. They make up 5 to 15 percent of the unit.

The Shelby soil is moderately slowly permeable. The available water capacity is high, and runoff is rapid. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If row crops are grown, further erosion is a severe hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, grassed waterways, contour farming, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

This soil is moderately suited to pasture and hay. Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

The land capability classification is IIIe.

24E2—Shelby loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained soil is on convex side slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 5 to 15 acres in size.

Typically, the surface layer is very dark grayish brown loam about 7 inches thick. It is mixed with streaks and pockets of yellowish brown subsoil material. The subsoil is about 38 inches of yellowish brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown loam. In some areas the surface layer is mainly dark brown clay loam.

Included with this soil in mapping are small areas of Adair and Lamoni soils. These soils are higher on the landscape than the Shelby soil and have more clay in the subsoil. They make up 5 to 15 percent of the unit.

The Shelby soil is moderately slowly permeable. The available water capacity is high, and runoff is rapid. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is low in content of available phosphorus and potassium.

Some areas are cultivated. This soil is poorly suited to intensive row cropping. It is best suited to small grain and to grasses and legumes for hay and pasture. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. When a pasture is renovated, operating farm machinery on this moderately steep soil can be difficult and dangerous. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

The land capability classification is IVe.

51—Vesser silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on the higher parts of bottom land. It is subject to flooding. Areas are irregularly shaped and range from 5 to 30 acres in size.

Typically, the surface layer is very dark gray silt loam about 9 inches thick. The subsurface layer is very dark gray and dark gray silt loam about 28 inches thick. It is mottled in the lower part. The subsoil to a depth of about 60 inches is gray, dark gray, and very dark gray, mottled, firm silty clay loam. In some small areas the surface layer is dark grayish brown or very dark grayish brown silt loam overwash as much as 10 inches thick.

Included with this soil in mapping are small areas of the poorly drained Chequest soils in the lower positions on the landscape. These soils contain more clay than the Vesser soil and are more difficult to drain. They make up 5 to 10 percent of the unit.

The Vesser soil is moderately permeable. The available water capacity is high, and runoff is slow. The soil has a seasonal high water table. The content of organic matter typically is 3 to 4 percent in the surface layer. The subsoil is low in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Row crops can be grown in many years if the soil is adequately drained and protected from floodwater. A subsurface drainage system is needed. In many areas diversion terraces are needed to protect the soil from the runoff from the higher surrounding areas. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

The land capability classification is IIw.

51+—Vesser silt loam, overwash, 0 to 2 percent slopes. This nearly level, poorly drained soil is on the higher parts of bottom land and on foot slopes and alluvial fans. It is subject to flooding. Areas are irregularly shaped and range from 5 to 10 acres in size.

Typically, the surface layer is recently deposited alluvium about 12 inches thick. It is dark grayish brown and very dark grayish brown silt loam. Below this is a buried surface layer of very dark gray silt loam about 9 inches thick. The next layer is very dark gray and dark gray, mottled silt loam about 28 inches thick. The subsoil to a depth of about 60 inches is gray, dark gray, and very dark gray, mottled, firm silty clay loam.

Included with this soil in mapping are small areas of Olmitz and Zook soils. These soils are in scattered areas throughout the map unit. Olmitz soils are better drained than the Vesser soil and contain more sand,

and Zook soils are more poorly drained, contain more clay, and are more difficult to drain. Included soils make up 5 to 15 percent of the unit.

The Vesser soil is moderately permeable. The available water capacity is high, and runoff is slow. The soil has a seasonal high water table. The content of organic matter typically is 1.5 to 2.5 percent in the surface layer. The subsoil is low in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated. This soil is moderately well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Row crops can be grown in many years if the soil is adequately drained and protected from floodwater. A subsurface drainage system is needed. In many areas diversion terraces are needed to protect the soil from the runoff from the higher surrounding areas. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

The land capability classification is IIw.

51B—Vesser silt loam, 2 to 5 percent slopes. This gently sloping, poorly drained soil is on foot slopes and alluvial fans. Areas are irregularly shaped and range from 3 to 15 acres in size.

Typically, the surface layer is very dark gray silt loam about 9 inches thick. The subsurface layer is very dark gray and dark gray silt loam about 28 inches thick. It is mottled in the lower part. The subsoil to a depth of about 60 inches is gray, dark gray, and very dark gray, mottled, firm silty clay loam. In some small areas the surface layer is dark grayish brown or very dark grayish brown silt loam overwash as much as 10 inches thick.

Included with this soil in mapping are scattered small areas of Olmitz soils. These soils are better drained than the Vesser soil and contain more sand. They make up 5 to 10 percent of the unit.

The Vesser soil is moderately permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The content of organic matter typically is 2.5 to 3.5 percent in the surface layer. The subsoil is medium in content of available phosphorus and low in content of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Row crops can be grown in many years if the soil is adequately drained. A subsurface drainage system is needed. In many areas diversion terraces are needed to protect the soil from the runoff from the higher surrounding areas. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

The land capability classification is IIw.

51B+—Vesser silt loam, overwash, 2 to 5 percent slopes. This gently sloping, poorly drained soil is on foot slopes and alluvial fans. Areas are irregularly shaped and range from 3 to 15 acres in size.

Typically, the surface layer is recently deposited alluvium about 12 inches thick. It is dark grayish brown and very dark grayish brown silt loam. Below this is a buried surface layer of very dark gray silt loam about 9 inches thick. The next layer is very dark gray and dark gray, mottled silt loam about 28 inches thick. The subsoil to a depth of about 60 inches is gray, dark gray, and very dark gray, mottled, firm silty clay loam.

Included with this soil in mapping are scattered small areas of Olmitz soils. These soils are better drained than the Vesser soil and contain more sand. They make up 5 to 10 percent of the unit.

The Vesser soil is moderately permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The content of organic matter typically is 1.5 to 2.5 percent in the surface layer. The subsoil is medium in content of available phosphorus and low in content of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Row crops can be grown in many years if the soil is adequately drained. A subsurface drainage system is needed. In many areas diversion terraces are needed to protect the soil from the runoff from the higher surrounding areas. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, and adequate livestock watering facilities help to keep the pasture or hayland in good condition.

The land capability classification is IIw.

54—Zook silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on bottom land. It is subject to flooding. Areas are irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is black silty clay loam about 9 inches thick. The subsurface layer is about 21 inches of black and very dark gray silty clay. The subsoil is about 13 inches of very dark gray, friable silty clay and dark gray, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is dark gray, mottled silty clay loam. In some small areas the surface layer is dark grayish brown or very dark grayish brown loam overwash as much as 10 inches thick.

Included with this soil in mapping are small areas of Chequest soils in the slightly higher positions on the landscape. These soils are easier to drain than the Zook soil. They make up 5 to 10 percent of the unit.

The Zook soil is slowly permeable. The available water capacity is high, and runoff is slow. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 5 to 7 percent in the surface layer..The subsoil is medium in content of available phosphorus and low in content of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Row crops can be grown in many years if the soil is adequately drained and protected from floodwater. A surface and subsurface drainage system is needed. In many areas diversion terraces are needed to protect the soil from the runoff from the higher surrounding areas. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

The land capability classification is IIw.

54+—Zook silt loam, overwash, 0 to 2 percent slopes. This nearly level, poorly drained soil is on bottom land. It is subject to flooding. Areas are irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is recently deposited alluvium about 14 inches thick. It is dark gray, dark grayish brown, and brown silt loam. The subsurface layer is about 32 inches of black and very dark gray, mottled silty clay loam and silty clay. The subsoil to a depth of about 60 inches is dark gray, mottled silty clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Ackmore soils in the slightly higher positions on the landscape. These soils have a stratified surface layer that is lower in content of clay than that of the Zook soil. They make up 5 to 10 percent of the unit.

The Zook soil is slowly permeable. The available water capacity is high, and runoff is slow. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 4 percent in the surface layer. The subsoil is medium in content of available phosphorus and low in content of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Row crops can be grown in many years if the soil is adequately drained and protected from floodwater. A surface and subsurface drainage system is needed. In many areas diversion terraces are needed to protect the soil from the runoff from the higher surrounding areas. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

The land capability classification is IIw.

56B—Cantril loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on low, slightly concave foot slopes. It is downslope from moderately steep or steep soils that formed in glacial till. Areas are long and narrow and range from 5 to 10 acres in size.

Typically, the surface layer is very dark gray loam

about 8 inches thick. The subsurface layer is dark grayish brown loam about 15 inches thick. The subsoil is about 30 inches of dark grayish brown and dark brown, mottled clay loam. The upper part is friable, and the lower part is firm. The substratum to a depth of about 60 inches is dark grayish brown, mottled clay loam. In some small areas the very dark gray surface soil is more than 10 inches thick. In other small areas the surface layer is grayish brown loam overwash as much as 8 inches thick.

Included with this soil in mapping are small areas of Coppock and Tuskeego soils on the lower parts of the foot slopes. These soils contain more silt and less sand than the Cantril soil. They make up 5 to 15 percent of the unit.

The Cantril soil is moderately permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The content of organic matter typically is about 2.5 to 3.5 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Some areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a severe hazard because of excessive runoff from the adjacent slopes. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, diversion terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Returning crop residue to the soil or regularly adding other organic material improves fertility.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

Some small areas support native hardwoods. This soil is well suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly.

The land capability classification is IIe.

58D2—Douds loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained soil is on the convex side slopes of high stream benches. Areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown loam about 4 inches thick. It is mixed with some streaks and pockets of brown subsoil material. The subsoil is about 44 inches thick. The upper part is brown, friable loam and sandy clay loam. The lower part is yellowish brown, friable sandy clay loam and clay loam. The substratum to a depth of about 60 inches is stratified light brownish gray, pale brown, and light yellowish brown loam and sandy loam. In some small areas the surface layer is mainly brown clay loam.

Included with this soil in mapping are small areas of Galland soils, which are generally in the higher positions on the landscape. These soils are redder than the Douds soil and have a more clayey subsoil. They make up 5 to 10 percent of the unit.

The Douds soil is moderately permeable. The available water capacity is moderate, and runoff is rapid. The soil has a seasonal high water table. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

This soil is used for pasture, hay, and row crops. It is poorly suited to intensive row cropping. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, grassed waterways, a cropping sequence that includes grasses and legumes, and diversion terraces. A combination of these measures is needed. The terraces should be built on the lowest part of the side slopes so that the adjacent soils on foot slopes are protected from runoff. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, further erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

Some small areas support native hardwoods. This soil is well suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly.

The land capability classification is IVe.

65E—Lindley loam, 14 to 18 percent slopes. This moderately steep, well drained soil is on convex nose slopes and side slopes in the uplands. Areas are long

and narrow or irregularly shaped and range from 5 to 30 acres in size.

Typically, the surface layer is very dark grayish brown loam about 3 inches thick. The subsurface layer is brown and yellowish brown loam about 5 inches thick. The subsoil is yellowish brown clay loam about 36 inches thick. It is friable in the upper part and mottled and firm in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Included with this soil in mapping are small areas of Keswick soils on the upper parts of the side slopes. These soils contain more clay in the subsoil than the Lindley soil. They make up 5 to 10 percent of the unit.

The Lindley soil is moderately slowly permeable. The available water capacity is high, and runoff is rapid. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is low in content of available phosphorus and very low in content of available potassium.

Most areas are used as pasture or woodland. This soil is unsuited to cultivated crops because of the slope and a severe hazard of erosion. In areas that have been cleared for use as pasture and hayland, good management is needed because erosion is a severe hazard and reestablishing a plant cover is difficult. Tilling the soil increases the susceptibility to erosion. As a result, the grasses and legumes should be interseeded into the existing sod. When a pasture is renovated, operating farm machinery on this moderately steep soil can be difficult and dangerous. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

Some areas support native hardwoods. This soil is well suited to trees. Carefully locating skid trails and logging roads reduces the hazard of erosion. Laying out the trails or roads on or nearly on the contour also helps to control erosion. Because of the slope, operating equipment is somewhat hazardous. Special equipment and caution in operating the equipment are needed.

This soil is suited to woodland wildlife habitat. Excluding livestock from wooded areas, constructing water impoundment reservoirs, planting trees and shrubs, and establishing food plots adjacent to the wooded areas help to maintain or improve the habitat.

The land capability classification is VIe.

65E2—Lindley loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained soil is on convex nose slopes and side slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 5 to 30 acres in size.

Typically, the surface layer is dark grayish brown loam about 5 inches thick. It is mixed with streaks and pockets of yellowish brown subsoil material. The subsoil is yellowish brown clay loam about 30 inches thick. It is friable in the upper part and firm and mottled in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In some severely eroded areas, the surface layer is mainly yellowish brown clay loam.

Included with this soil in mapping are small areas of Keswick soils on the upper parts of the side slopes. These soils contain more clay in the subsoil than the Lindley soil. They make up 5 to 10 percent of the unit.

The Lindley soil is moderately slowly permeable. The available water capacity is high, and runoff is rapid. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer. The subsoil is low in content of available phosphorus and very low in content of available potassium.

Most areas are used as pasture or woodland. This soil is unsuited to cultivated crops because of the slope and a severe hazard of further erosion. In areas that have been cleared for use as pasture and hayland, good management is needed because further erosion is a severe hazard and reestablishing a plant cover is difficult. Tilling the soil increases the susceptibility to erosion. As a result, the grasses and legumes should be interseeded into the existing sod. When a pasture is renovated, operating farm machinery on this moderately steep soil can be difficult and dangerous. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

Some areas support native hardwoods. This soil is well suited to trees. Carefully locating skid trails and logging roads reduces the hazard of erosion. Laying out the trails or roads on or nearly on the contour also helps to control erosion. Because of the slope, operating equipment is somewhat hazardous. Special equipment and caution in operating the equipment are needed. Seedling mortality is a problem. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density.

This soil is suited to woodland wildlife habitat. Excluding livestock from wooded areas, constructing

water impoundment reservoirs, planting trees and shrubs, and establishing food plots adjacent to the wooded areas help to maintain or improve the habitat.

The land capability classification is VIe.

65F—Lindley loam, 18 to 40 percent slopes. This steep and very steep, well drained soil is on valley side slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 10 to 60 acres in size.

Typically, the surface layer is very dark grayish brown and dark grayish brown loam about 3 inches thick. The subsurface layer is brown and yellowish brown loam about 5 inches thick. The subsoil is yellowish brown clay loam about 36 inches thick. It is friable in the upper part and mottled and firm in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Included with this soil in mapping are small areas of Keswick soils on the upper parts of the side slopes. These soils contain more clay in the subsoil than the Lindley soil. They make up 5 to 10 percent of the unit.

The Lindley soil is moderately slowly permeable. The available water capacity is high, and runoff is very rapid. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is low in content of available phosphorus and very low in content of available potassium.

Most areas are used as pasture, woodland, or wildlife habitat. This soil is unsuited to cultivated crops because of the slope and a severe hazard of erosion. In areas that have been cleared for use as pasture, good management is needed because erosion is a severe hazard and reestablishing a plant cover is difficult. Tilling the soil increases the susceptibility to erosion. As a result, the grasses and legumes should be interseeded into the existing sod. When a pasture is renovated, operating farm machinery on this steep and very steep soil is difficult and dangerous. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture in good condition.

Many areas support native hardwoods. This soil is well suited to trees. Carefully locating skid trails or logging roads reduces the hazard of erosion. Laying out the trails or roads on or nearly on the contour also helps to control erosion. Because of the slope, operating equipment is somewhat hazardous. Special equipment and caution in operating the equipment are needed.

This soil is suited to woodland wildlife habitat. Excluding livestock from areas where trees and shrubs are planted and establishing food plots adjacent to the wooded areas help to maintain or improve the habitat.

The land capability classification is VIIe.

65F2—Lindley loam, 18 to 25 percent slopes, moderately eroded. This steep and very steep, well drained soil is on valley side slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 10 to 60 acres in size.

Typically, the surface layer is dark grayish brown loam about 5 inches thick. It is mixed with some streaks and pockets of yellowish brown subsoil material. The subsoil is about 30 inches of yellowish brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In some areas the surface layer is mainly yellowish brown clay loam.

Included with this soil in mapping are small areas of Keswick soils on the upper parts of the side slopes. These soils contain more clay in the subsoil than the Lindley soil. They make up 5 to 10 percent of the unit.

The Lindley soil is moderately slowly permeable. The available water capacity is high, and runoff is very rapid. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer. The subsoil is low in content of available phosphorus and very low in content of available potassium.

Most areas are used as pasture, woodland, or wildlife habitat. This soil is unsuited to cultivated crops because of the slope and a severe hazard of further erosion. In areas that have been cleared for use as pasture, good management is needed because further erosion is a severe hazard and reestablishing a plant cover is difficult. Tilling the soil increases the susceptibility to erosion. As a result, the grasses and legumes should be interseeded into the existing sod. When a pasture is renovated, operating farm machinery on this steep and very steep soil is difficult and dangerous. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture in good condition.

Some areas support native hardwoods. This soil is well suited to trees. Carefully locating skid trails or logging roads reduces the hazard of erosion. Laying out the trails or roads on or nearly on the contour also helps to control erosion. Because of the slope, operating equipment is somewhat hazardous. Special equipment and caution in operating the equipment are

needed. Seedling mortality is a problem. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density.

This soil is suited to woodland wildlife habitat. Excluding livestock from wooded areas, constructing water impoundment reservoirs, planting trees and shrubs, and establishing food plots adjacent to the wooded areas help to maintain or improve the habitat.

The land capability classification is VIIe.

80B—Clinton silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on convex ridgetops and short, convex side slopes in the loess-covered uplands. Areas are long and narrow or irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer is brown silt loam about 6 inches thick. The subsoil to a depth of about 60 inches is friable and firm silty clay loam. The upper part is yellowish brown and dark yellowish brown, the next part is brown, and the lower part is yellowish brown. In some small areas some of the subsoil is mixed with the surface layer.

Included with this soil in mapping are small areas of poorly drained soils on the less sloping parts of the landscape. These soils make up 5 to 10 percent of the unit.

The Clinton soil is moderately slowly permeable. The available water capacity is high, and runoff is medium. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is high in content of available phosphorus and low in content of available potassium.

Most areas are cultivated or used for hay and pasture. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the less productive subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, erosion is a hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few small areas support native hardwoods. This soil is well suited to trees. Seedlings survive and grow well if competing vegetation is controlled or removed by careful site preparation or by spraying, cutting, or girdling.

The land capability classification is IIe.

80C—Clinton silt loam, 5 to 9 percent slopes. This moderately sloping, moderately well drained soil is on convex ridgetops and short, convex side slopes in the loess-covered uplands. Areas are long and narrow or irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer is brown silt loam about 6 inches thick. The subsoil to a depth of about 60 inches is firm silty clay loam. The upper part is yellowish brown and dark yellowish brown, the next part is brown, and the lower part is yellowish brown. In some small areas some of the subsoil is mixed with the surface layer.

This soil is moderately slowly permeable. The available water capacity is high, and runoff is medium. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is high in content of available phosphorus and low in content of available potassium.

Most areas are used as pasture or woodland. This soil is moderately suited to corn and soybeans. It is best suited to small grain and to grasses and legumes for hay or pasture. If cultivated crops are grown, erosion is a severe hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the less productive subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates,

pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few small areas support native hardwoods. This soil is well suited to trees. Seedlings survive and grow well if competing vegetation is controlled or removed by careful site preparation or by spraying, cutting, or girdling.

The land capability classification is IIIe.

80C2—Clinton silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on convex ridgetops and short, convex side slopes in the loess-covered uplands. Areas are long and narrow or irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is brown silt loam about 6 inches thick. It is mixed with streaks and pockets of yellowish brown subsoil material. The subsoil to a depth of about 60 inches is firm silty clay loam. The upper part is yellowish brown and dark yellowish brown, the next part is brown, and the lower part is yellowish brown. In some small areas the surface layer is mainly yellowish brown silty clay loam.

This soil is moderately slowly permeable. The available water capacity is high, and runoff is medium. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer. The subsoil is high in content of available phosphorus and low in content of available potassium.

Most areas are cultivated or used for pasture and hay. This soil is moderately suited to corn and soybeans. It is best suited to small grain and to grasses and legumes for hay or pasture. If cultivated crops are grown, further erosion is a severe hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the less productive subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

This soil is well suited to trees. Seedlings survive and grow well if competing vegetation is controlled or removed by careful site preparation or by spraying, cutting, or girdling.

The land capability classification is IIIe.

80D2—Clinton silt loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained soil is on short, convex side slopes in the loess-covered uplands. Areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is brown silt loam about 6 inches thick. It is mixed with streaks and pockets of yellowish brown subsoil material. The subsoil to a depth of about 60 inches is firm silty clay loam. The upper part is yellowish brown and dark yellowish brown, the next part is brown, and the lower part is yellowish brown. In some small areas the surface layer is mainly yellowish brown silty clay loam.

Included with this soil in mapping are small areas of the moderately well drained Keswick soils. These soils are on the lower parts of the slopes. They contain more clay than the Clinton soil. They make up 5 to 10 percent of the unit.

The Clinton soil is moderately slowly permeable. The available water capacity is high, and runoff is rapid. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer. The subsoil is high in content of available phosphorus and low in content of available potassium.

Most areas are used for pasture and hay. This soil is moderately suited to corn and soybeans. It is best suited to small grain and to grasses and legumes for hay or pasture. If cultivated crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking

rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

This soil is well suited to trees. Seedlings survive and grow well if competing vegetation is controlled or removed by careful site preparation or by spraying, cutting, or girdling.

The land capability classification is IIIe.

93D2—Adair-Shelby complex, 9 to 14 percent slopes, moderately eroded. These strongly sloping soils are on short, convex side slopes and convex nose slopes in the uplands. The moderately well drained or somewhat poorly drained Adair soil is on the upper parts of the slopes, and the well drained Shelby soil is on the lower parts. Areas are long and narrow or irregularly shaped and range from 5 to 40 acres in size. They are about 60 percent Adair soil and 30 percent Shelby soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Adair soil is very dark grayish brown clay loam about 7 inches thick. It is mixed with streaks and pockets of brown subsoil material. The subsoil is about 45 inches thick. The upper part is brown, friable clay loam; the next part is strong brown, mottled, very firm clay; and the lower part is strong brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In some small areas the surface layer is mainly brown clay loam.

Typically, the surface layer of the Shelby soil is very dark gray loam about 9 inches thick. It is mixed with streaks and pockets of dark yellowish brown subsoil material. The subsoil is about 40 inches of yellowish brown, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown loam.

Included with these soils in mapping are small areas of Clarinda and Lamoni soils. These included soils contain more clay in the subsoil than the Adair and Shelby soils. Also, they are higher on the slopes. Clarinda soils are poorly drained. Included soils make up about 10 percent of the unit.

Permeability is slow in the Adair soil and moderately slow in the Shelby soil. The available water capacity is high in both soils, and runoff is rapid. The Adair soil has a seasonal high water table. It also has a high shrink-swell potential. The content of organic matter typically is about 2 to 3 percent in the surface layer of both soils. The subsoil is very low in content of available phosphorus and potassium.

Most areas are cultivated or used for pasture and hay. These soils are poorly suited to intensive row cropping. They are moderately suited to pasture and hay. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

The land capability classification is IVe.

94E2—Caleb-Mystic complex, 14 to 18 percent slopes, moderately eroded. These moderately steep soils are on the convex side slopes of high stream benches. The moderately well drained Caleb soil is on the lower parts of the slopes, and the moderately well drained or somewhat poorly drained Mystic soil is on the upper parts. Areas are long and narrow or irregularly shaped and range from 5 to 30 acres in size. They are about 60 percent Caleb soil and 40 percent Mystic soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Caleb soil is very dark grayish brown loam about 6 inches thick. It is mixed with streaks and pockets of brown subsoil material. The subsoil is about 41 inches thick. The upper part is brown, friable loam; the next part is dark yellowish brown, friable loam; and the lower part is light yellowish brown and yellowish brown, very friable and loose sandy loam and loamy sand. The substratum to a depth of about 60 inches is yellowish brown sandy clay loam. In some small areas the surface layer is mainly brown loam.

Typically, the surface layer of the Mystic soil is very dark grayish brown silt loam about 6 inches thick. It is

mixed with streaks and pockets of yellowish brown subsoil material. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is dark brown, friable and firm clay loam and clay; the next part is brown, firm clay; and the lower part is yellowish brown, firm and friable sandy clay loam and sandy loam. In some small areas the surface layer is mainly dark brown clay loam.

The Caleb soil is moderately permeable, and the Mystic soil is slowly permeable. The available water capacity is moderate in the Caleb soil and high in the Mystic soil. Runoff is rapid on both soils. The shrink-swell potential is high in the Mystic soil. Both soils have a seasonal high water table. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and low in content of available potassium.

Most areas are used as pasture and hayland. These soils are unsuited to row crops because of the slope and a severe hazard of further erosion. In areas that are used for hay and pasture, good management is needed because further erosion is a severe hazard and reestablishing a plant cover is difficult. Tilling the soils increases the susceptibility to erosion. As a result, grasses and legumes should be interseeded into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few small areas support native hardwoods. These soils are moderately suited to trees. Carefully locating skid trails and logging roads reduces the hazard of erosion. Laying out the trails or roads on or nearly on the contour also helps to control erosion. Because of the slope, operating equipment is somewhat hazardous. Special equipment and caution in operating the equipment are needed.

These soils are suited to woodland wildlife habitat. Excluding livestock from wooded areas, constructing water impoundment reservoirs, planting trees and shrubs, and establishing food plots adjacent to the wooded areas help to maintain or improve the habitat.

The land capability classification is VIe.

130—Belinda silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on narrow or moderately broad divides in the loess-covered uplands. Areas are irregularly shaped and range from 5 to 30 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is grayish brown and light brownish gray silt loam about 8 inches thick. The subsoil to a depth of about 60 inches is grayish brown and dark grayish brown and is mottled. The upper part is friable silty clay loam, the next part is firm silty clay, and the lower part is firm silty clay loam.

Included with this soil in mapping are small areas of the moderately well drained or somewhat poorly drained Pershing soils on the more sloping parts of the landscape. These soils make up 5 to 10 percent of the unit.

The Belinda soil is very slowly permeable. The available water capacity is high, and runoff is very slow. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter is typically 2 to 3 percent in the surface layer. The subsoil is medium in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. A surface and subsurface drainage system is needed. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Management can be difficult, however, because this soil is poorly drained and is ponded for brief periods. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few areas are used as native woodland. This soil is moderately suited to trees. Equipment should be used only during the drier parts of the year or during winter, when the ground is frozen. Special high flotation equipment can be used for harvesting or woodland management if it is necessary during wet periods. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IIIw.

131B—Pershing silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained or somewhat poorly drained soil is on convex ridgetops

and side slopes bordering nearly level, stable interstream divides in the loess-covered uplands. Areas are long and narrow or irregularly shaped and range from 5 to 30 acres in size.

Typically, the surface layer is very dark gray silt loam about 8 inches thick. The subsurface layer is dark grayish brown silt loam about 3 inches thick. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is brown and dark grayish brown, friable silty clay loam; the next part is grayish brown, firm silty clay; and the lower part is light brownish gray and light olive gray, firm and friable silty clay loam. In some small areas some of the subsoil is mixed with the surface layer.

Included with this soil in mapping are small areas of the poorly drained Belinda soils on the less sloping parts of the landscape. These soils make up 5 to 10 percent of the unit.

The Pershing soil is slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2.5 to 3.5 percent in the surface layer. The subsoil is medium in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a severe hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the less productive subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few areas are used as native woodland. This soil is moderately suited to trees. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IIIe.

131C2—Pershing silty clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained or somewhat poorly drained soil is on narrow, convex ridgetops and short, convex side slopes in the loess-covered uplands. Areas are long and narrow or irregularly shaped and range from 5 to 80 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 7 inches thick. It is mixed with streaks and pockets of brown and dark grayish brown subsoil material. The subsoil is about 40 inches thick. It is mottled. The upper part is grayish brown and light brownish gray, firm silty clay, and the lower part is light olive gray, friable silty clay loam. The substratum to a depth of about 60 inches is light olive gray, mottled silty clay loam. In some small areas the surface layer is mainly grayish brown silty clay.

Included with this soil in mapping are small areas of the moderately well drained and somewhat poorly drained Armstrong and poorly drained Rinda soils on the lower parts of the side slopes. These soils contain more clay in the subsoil than the Pershing soil and can be seepy during wet periods. They make up about 5 to 15 percent of the unit.

The Pershing soil is slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is medium in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated or used for hay and pasture. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a severe hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the less productive subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding

other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few areas are used as native woodland. This soil is moderately suited to trees. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IIIe.

132B—Weller silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on convex ridgetops and short, convex side slopes in the loess-covered uplands. Areas are long and narrow or irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is very dark grayish brown and dark grayish brown silt loam about 3 inches thick. The subsurface layer is about 14 inches of grayish brown, brown, and yellowish brown silt loam and silty clay loam. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is yellowish brown, firm silty clay loam and silty clay; the next part is yellowish brown and grayish brown, firm silty clay and silty clay loam; and the lower part is light brownish gray, friable silty clay loam. In some small areas some of the subsoil is mixed with the surface layer.

Included with this soil in mapping are small areas of the poorly drained Beckwith soils on the less sloping parts of the landscape. These soils make up 5 to 10 percent of the unit.

The Weller soil is slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is medium in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated or used as pasture or woodland. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a severe hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the less productive subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

Some areas are used as native woodland. This soil is moderately suited to trees. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IIIe.

132C—Weller silt loam, 5 to 9 percent slopes. This moderately sloping, moderately well drained soil is on convex ridgetops and on short, convex side slopes in the loess-covered uplands. Areas are long and narrow or irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 3 inches thick. The subsurface layer is grayish brown silt loam about 11 inches thick. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is yellowish brown, friable and firm silty clay loam and silty clay; the next part is yellowish brown and grayish brown, firm silty clay and silty clay loam; and the lower part is light brownish gray, friable silty clay loam. In some small areas some of the subsoil is mixed with the surface layer.

Included with this soil in mapping are small areas of

the moderately well drained Keswick and poorly drained Ashgrove soils. These soils are on the lower parts of the side slopes. They contain more clay than the Weller soil. They make up about 5 to 10 percent of the unit.

The Weller soil is slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is medium in content of available phosphorus and very low in content of available potassium.

Most areas are used as pasture or woodland. This soil is moderately suited to corn and soybeans. It is best suited to small grain and to grasses and legumes. for hay and pasture. If cultivated crops are grown, erosion is a severe hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the less productive subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, applications of fertilizer, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

Some areas are used as native woodland. This soil is moderately suited to trees. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IIIe.

132C2—Weller silty clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on convex ridgetops and short, convex side slopes in the loess-covered uplands. Areas are long and narrow or irregularly shaped and range from 5 to 80 acres in size.

Typically, the surface layer is dark grayish brown silty clay loam about 6 inches thick. It is mixed with streaks and pockets of yellowish brown subsoil material. The subsoil is about 50 inches thick. It is mottled. The upper part is yellowish brown, friable and firm silty clay loam; the next part is yellowish brown and grayish brown, firm silty clay; and the lower part is grayish brown and yellowish brown, firm silty clay loam. The substratum to a depth of about 60 inches is light brownish gray, mottled silty clay loam. In some small areas the surface layer is mainly yellowish brown silty clay loam.

Included with this soil in mapping are small areas of the moderately well drained Keswick and poorly drained Ashgrove soils. These soils are on the lower parts of the slopes. They contain more clay than the Weller soil. They make up about 5 to 10 percent of the unit.

The Weller soil is slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer. The subsoil is medium in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated or used for pasture and hay. This soil is moderately suited to corn and soybeans. It is best suited to small grain and to grasses and legumes for hay or pasture. If cultivated crops are grown, further erosion is a severe hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the less productive subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, applications of fertilizer, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few areas are used as native woodland. This soil is moderately suited to trees. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the

seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IIIe.

179D2—Gara loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained soil is on convex side slopes and nose slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 10 to 50 acres in size.

Typically, the surface layer is very dark grayish brown loam about 7 inches thick. It is mixed with streaks and pockets of brown subsoil material. The subsoil is clay loam about 33 inches thick. The upper part is dark yellowish brown and friable, the next part is dark yellowish brown and firm, and the lower part is yellowish brown, mottled, and firm. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In some small areas the surface layer is mainly dark yellowish brown clay loam.

Included with this soil in mapping are small areas of Armstrong and Rinda soils on the upper parts of the side slopes. These soils are less well drained than the Gara soil and are seepy during wet periods. They make up 5 to 15 percent of the unit.

The Gara soil is moderately slowly permeable. The available water capacity is high, and runoff is rapid. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is low in content of available phosphorus and very low in content of available potassium.

Most areas are used for hay, pasture, or row crops. This soil is poorly suited to intensive row cropping. It is best suited to small grain and to grasses and legumes for hay and pasture. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Returning crop residue to the soil or regularly adding organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, further erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

A few small areas support native hardwoods. This soil is well suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly.

The land capability classification is IVe.

179E—Gara loam, 14 to 18 percent slopes. This moderately steep, well drained soil is on convex nose slopes and valley side slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 10 to 40 acres in size.

Typically, the surface layer is very dark gray loam about 7 inches thick. The subsurface layer is dark grayish brown loam about 4 inches thick. The subsoil is clay loam about 35 inches thick. The upper part is dark yellowish brown and friable, the next part is dark yellowish brown and firm, and the lower part is yellowish brown, mottled, and firm. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In some small areas some of the subsoil is mixed with the surface layer.

Included with this soil in mapping are small areas of Armstrong and Bucknell soils on the upper parts of the side slopes. These soils contain more clay in the subsoil than the Gara soil and are seepy during wet periods. They make up 5 to 15 percent of the unit.

The Gara soil is moderately slowly permeable. The available water capacity is high, and runoff is rapid. The content of organic matter typically is about 2.5 to 3.5 percent in the surface layer. The subsoil is low in content of available phosphorus and very low in content of available potassium.

Most areas are used as pasture or woodland. This soil is unsuited to cultivated crops because of the slope and a severe hazard of erosion. Managing areas that have been cleared for pasture is difficult because of the slope. Erosion is a severe hazard in these areas because reestablishing a plant cover is difficult. When a pasture is renovated, operating farm machinery on this moderately steep soil can be difficult and dangerous. Maximum production of grasses and legumes can be achieved if the pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition. If the pasture or

hayland is tilled, erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

Many areas support native hardwoods. This soil is moderately suited to trees. Carefully locating skid trails and logging roads reduces the hazard of erosion. Laying out the trails or roads on or nearly on the contour also helps to control erosion. Because of the slope, operating equipment is somewhat hazardous. Special equipment and caution in operating the equipment are needed.

This soil is suited to woodland wildlife habitat. Excluding livestock from wooded areas, constructing water impoundment reservoirs, planting trees and shrubs, and establishing food plots adjacent to the wooded areas help to maintain or improve the habitat.

The land capability classification is VIe.

179E2—Gara loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained soil is on convex nose slopes and valley side slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 10 to 100 acres in size.

Typically, the surface layer is very dark grayish brown loam about 7 inches thick. It is mixed with streaks and pockets of brown subsoil material. The subsoil is clay loam about 33 inches thick. The upper part is dark yellowish brown and friable, the next part is dark yellowish brown and firm, and the lower part is yellowish brown, mottled, and firm. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In some small areas the surface layer is mainly dark yellowish brown clay loam.

Included with this soil in mapping are small areas of Armstrong and Bucknell soils on the upper parts of the side slopes. These soils contain more clay in the subsoil than the Gara soil and are seepy during wet periods. They make up 5 to 15 percent of the unit.

The Gara soil is moderately slowly permeable. The available water capacity is high, and runoff is rapid. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is low in content of available phosphorus and very low in content of available potassium.

Most areas are used as pasture or woodland. This soil is unsuited to cultivated crops because of the slope and a severe hazard of further erosion. Managing areas that have been cleared for pasture is difficult because of the slope. Further erosion is a severe hazard in these areas because reestablishing a plant cover is difficult. When a pasture is renovated, operating farm machinery on this moderately steep soil can be difficult and dangerous. Maximum production of grasses and legumes can be achieved if the pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, further erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

Many small areas support native hardwoods. This soil is moderately suited to trees. Carefully locating skid trails and logging roads reduces the hazard of erosion. Laying out the trails or roads on or nearly on the contour also helps to control erosion. Because of the slope, operating equipment is somewhat hazardous. Special equipment and caution in operating the equipment are needed.

This soil is suited to woodland wildlife habitat. Excluding livestock from wooded areas, constructing water impoundment reservoirs, planting trees and shrubs, and establishing food plots adjacent to the wooded areas help to maintain or improve the habitat.

The land capability classification is VIe.

179E3—Gara clay loam, 14 to 18 percent slopes, severely eroded. This moderately steep, well drained soil is on convex nose slopes and valley side slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is a plow layer of yellowish brown clay loam about 4 inches thick. Generally, plowing has mixed mainly subsoil material into the plow layer. The subsoil is yellowish brown, firm clay loam about 32 inches thick. It is mottled in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Included with this soil in mapping are small areas of Armstrong and Bucknell soils on the upper parts of the side slopes. These soils contain more clay in the subsoil than the Gara soil and are seepy during wet periods. They make up 5 to 15 percent of the unit.

The Gara soil is moderately slowly permeable. The available water capacity is high, and runoff is rapid. The content of organic matter typically is about 1 to 2 percent in the surface layer. The subsoil is very low or low in content of available phosphorus and very low in content of available potassium.

Most areas are used as pasture. This soil is unsuited to cultivated crops because of the slope and a severe hazard of further erosion. Managing areas that have

been cleared for pasture is difficult because of the slope. Further erosion is a severe hazard in these areas because reestablishing a plant cover is difficult. When a pasture is renovated, operating farm machinery on this moderately steep soil can be difficult and dangerous. Maximum production of grasses and legumes can be achieved if the pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, further erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

Very few small areas support native hardwoods. This soil is moderately suited to trees. Carefully locating skid trails and logging roads reduces the hazard of erosion. Laying out the trails or roads on or nearly on the contour also helps to control erosion. Because of the slope, operating equipment is somewhat hazardous. Special equipment and caution in operating the equipment are needed.

This soil is suited to woodland wildlife habitat. Excluding livestock from wooded areas, constructing water impoundment reservoirs, planting trees and shrubs, and establishing food plots adjacent to the wooded areas help to maintain or improve the habitat.

The land capability classification is VIe.

179F—Gara loam, 18 to 25 percent slopes. This steep, well drained soil is on convex nose slopes and valley side slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 10 to 100 acres in size.

Typically, the surface layer is very dark grayish brown loam about 7 inches thick. The subsurface layer is dark grayish brown loam about 4 inches thick. The subsoil is clay loam about 35 inches thick. The upper part is dark yellowish brown and friable, the next part is dark yellowish brown and firm, and the lower part is yellowish brown, mottled, and firm. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In some small areas some of the subsoil is mixed with the surface layer.

Included with this soil in mapping are small areas of Armstrong soils on the upper parts of the side slopes. These soils contain more clay in the subsoil than the Gara soil. They make up 5 to 10 percent of the unit.

The Gara soil is moderately slowly permeable. The available water capacity is high, and runoff is very rapid. The content of organic matter typically is about 2.5 to 3.5 percent in the surface layer. The subsoil is low in content of available phosphorus and very low in content of available potassium.

Most areas are used as pasture or woodland. This soil is unsuited to cultivated crops because of the slope and a severe hazard of erosion. Managing areas that have been cleared for pasture is difficult because of the slope. Erosion is a severe hazard in these areas because reestablishing a plant cover is difficult. When a pasture is renovated, operating farm machinery on this steep soil can be difficult and dangerous. Maximum production of grasses and legumes can be achieved if the pasture is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture in good condition. If the pasture is tilled, erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

Many areas support native hardwoods. This soil is moderately suited to trees. Carefully locating skid trails or logging roads reduces the hazard of erosion. Laying out the trails or roads on or nearly on the contour also helps to control erosion. Because of the slope, operating equipment is somewhat hazardous. Special equipment and caution in operating the equipment are needed.

This soil is suited to woodland wildlife habitat. Excluding livestock from wooded areas, constructing water impoundment reservoirs, planting trees and shrubs, and establishing food plots adjacent to the wooded areas help to maintain or improve the habitat.

The land capability classification is VIe.

179F2—Gara loam, 18 to 25 percent slopes, moderately eroded. This steep, well drained soil is on convex nose slopes and valley side slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 10 to 100 acres in size.

Typically, the surface layer is very dark grayish brown loam about 7 inches thick. It is mixed with streaks and pockets of brown subsoil material. The subsoil is clay loam about 33 inches thick. The upper part is dark yellowish brown and friable, the next part is dark yellowish brown and firm, and the lower part is yellowish brown, mottled, and firm. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In some small areas the surface layer is mainly dark yellowish brown clay loam.

Included with this soil in mapping are small areas of Armstrong soils on the upper parts of the side slopes.

These soils contain more clay in the subsoil than the Gara soil. They make up 5 to 10 percent of the unit.

The Gara soil is moderately slowly permeable. The available water capacity is high, and runoff is very rapid. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is low in content of available phosphorus and very low in content of available potassium.

Most areas are used as pasture or woodland. This soil is unsuited to cultivated crops because of the slope and a severe hazard of further erosion. Managing areas that have been cleared for pasture is difficult because of the slope. Further erosion is a severe hazard in these areas because reestablishing a plant cover is difficult. When a pasture is renovated, operating farm machinery on this steep soil can be difficult and dangerous. Maximum production of grasses and legumes can be achieved if the pasture is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture in good condition. If the pasture is tilled, further erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

Many areas support native hardwoods. This soil is moderately suited to trees. Carefully locating skid trails or logging roads reduces the hazard of erosion. Laying out the trails or roads on or nearly on the contour also helps to control erosion. Because of the slope, operating equipment is somewhat hazardous. Special equipment and caution in operating the equipment are needed.

The land capability classification is VIIe.

179F3—Gara clay loam, 18 to 25 percent slopes, severely eroded. This steep, well drained soil is on convex nose slopes and valley side slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is a plow layer of yellowish brown clay loam about 4 inches thick. Generally, plowing has mixed mainly subsoil material into the plow layer. The subsoil is yellowish brown, firm clay loam about 32 inches thick. It is mottled in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Included with this soil in mapping are small areas of Armstrong soils on the upper parts of the side slopes. These soils contain more clay in the subsoil than the Gara soil. They make up 5 to 10 percent of the unit.

The Gara soil is moderately slowly permeable. The available water capacity is high, and runoff is very rapid. The content of organic matter typically is about 1 to 2 percent in the surface layer. The subsoil is low in content of available phosphorus and very low in content of available potassium.

Most areas are used as pasture. This soil is unsuited to cultivated crops because of the slope and a severe hazard of further erosion. Managing areas that have been cleared for pasture is difficult because of the slope. Further erosion is a severe hazard in these areas because reestablishing a plant cover is difficult. When a pasture is renovated, operating farm machinery on this steep soil can be difficult and dangerous. Maximum production of grasses and legumes can be achieved if the pasture is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture in good condition. If the pasture is tilled, further erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

Very few areas support native hardwoods. This soil is moderately suited to trees. Carefully locating skid trails or logging roads reduces the hazard of erosion. Laying out the trails or roads on or nearly on the contour also helps to control erosion. Because of the slope, operating equipment is somewhat hazardous. Special equipment and caution in operating the equipment are needed.

This soil is suited to woodland wildlife habitat. Excluding livestock from wooded areas, constructing water impoundment reservoirs, planting trees and shrubs, and establishing food plots adjacent to the wooded areas help to maintain or improve the habitat.

The land capability classification is VIIe.

192C2—Adair clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained or somewhat poorly drained soil is on narrow nose slopes and side slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 5 to 30 acres in size.

Typically, the surface layer is very dark gray clay loam about 7 inches thick. It is mixed with streaks and pockets of brown subsurface material. The subsoil is about 47 inches thick. The upper part is brown, friable clay loam; the next part is strong brown, mottled, very firm clay; and the lower part is strong brown and yellowish brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In some small areas the

surface layer is mainly brown clay loam.

Included with this soil in mapping are small areas of Clarinda soils on the upper side slopes. These soils are more poorly drained than the Adair soil. They make up 5 to 10 percent of the unit.

The Adair soil is slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table and has seepy spots during wet periods. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Many areas are cultivated. Some are used for hay and pasture. This soil is moderately suited to corn, soybeans, and small grain. It is best suited to grasses and legumes for hay and pasture. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the clayey subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, restricted use during wet periods, and adequate livestock watering facilities help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, further erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

The land capability classification is IIIe.

192D2—Adair clay loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained or somewhat poorly drained soil is on narrow nose slopes and side slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown clay loam about 7 inches thick. It is mixed with streaks and pockets of brown subsoil material. The subsoil is about 45 inches thick. The upper part is brown, friable clay loam; the next part is strong brown, mottled, very firm clay; and the lower part is strong brown and yellowish brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In some small areas the surface layer is mainly brown clay loam.

Included with this soil in mapping are small areas of Clarinda and Shelby soils. Clarinda soils are on the upper parts of the side slopes, and Shelby soils are on the lower parts. Clarinda soils are more poorly drained than the Adair soil, and Shelby soils have less clay in the subsoil. Included soils make up 5 to 15 percent of the unit.

The Adair soil is slowly permeable. The available water capacity is high, and runoff is rapid. The soil has a seasonal high water table and is seepy in some areas during wet periods. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are used for hay and pasture. Some are cultivated. This soil is poorly suited to intensive row cropping. It is best suited to small grain and to grasses and legumes for hay and pasture. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these practices is needed. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, restricted use during wet periods, and adequate livestock watering facilities help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, further erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

The land capability classification is IVe.

211—Edina silt loam, 0 to 1 percent slopes. This nearly level, poorly drained soil is in slightly depressional areas on broad flats in the loess-covered uplands. It is subject to ponding. Areas are irregularly shaped and range from 5 to more than 100 acres in size.

Typically, the surface layer is very dark gray silt loam about 9 inches thick. The subsurface layer is dark gray silt loam about 11 inches thick. The subsoil is about 29 inches thick. It is mottled. The upper part is very dark gray and dark gray, very firm silty clay; the next part is grayish brown, very firm silty clay; and the lower part is

olive gray, firm and friable silty clay and silty clay loam. The substratum to a depth of about 60 inches is light olive gray, mottled silty clay loam.

This soil is very slowly permeable. The available water capacity is high, and runoff is very slow. The soil has a seasonal high water table. The shrink-swell potential is very high. The content of organic matter typically is about 2.0 to 3.5 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. A surface drainage system is needed because wetness and low soil temperature delay spring planting. A surface drainage system helps to control ponding and thus helps to keep crops from drowning out. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Management may be difficult, however, because this soil is poorly drained and is ponded for brief periods. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, adequate livestock watering facilities, weed and brush control, and restricted use during wet periods help to keep the pasture or hayland in good condition.

The land capability classification is IIIw.

222C2—Clarinda silty clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, poorly drained soil is on short, convex side slopes, on convex nose slopes, and in coves at the upper end of drainageways in the uplands (fig. 6). Areas are long and narrow or irregularly shaped and range from 10 to more than 50 acres in size.

Typically, the surface layer is very dark gray silty clay loam about 6 inches thick. It is mixed with some streaks and pockets of dark gray subsoil material. The subsoil to a depth of about 60 inches is firm and very firm and mottled. The upper part is dark gray silty clay, the next part is gray silty clay, and the lower part is gray clay.

Included with this soil in mapping are small areas of the moderately well drained and somewhat poorly drained Adair and somewhat poorly drained Lamoni soils on the lower parts of the side slopes. These soils are better drained than the Clarinda soil and contain less clay. They make up 5 to 15 percent of the unit.

The Clarinda soil is very slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are cultivated. Unless conservation practices are applied, this soil is poorly suited to intensive row cropping. It is best suited to small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, wetness is a very serious limitation and further erosion is a severe hazard. In row cropped areas, erosion can be controlled by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the clayey subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration. In many areas a narrow, seepy band is on the upper part of the side slopes. This band commonly remains wet until midsummer. The soil warms up slowly in the spring and dries out very slowly after periods of rainfall. Planting is delayed in wet years. Tile drainage is not feasible in this very slowly permeable soil.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, and restricted use during wet periods help to keep the pasture or hayland in good condition.

The land capability classification is IVw.

222C3—Clarinda silty clay loam, 5 to 9 percent slopes, severely eroded. This moderately sloping, poorly drained soil is on short, convex side slopes, on convex nose slopes, and in coves at the upper end of drainageways in the uplands. Areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 5 inches thick. Generally, plowing has mixed mainly subsoil material into the surface layer. The subsoil to a depth of about 60 inches is very firm and mottled. The upper part is dark grayish brown silty clay, and the lower part is gray clay. In places the surface layer is silty clay.

Included with this soil in mapping are small areas of

Figure 6.—An area of Clarinda silty clay loam, 5 to 9 percent slopes, moderately eroded. The pond in the foreground is used for erosion control and recreational activities.

the moderately well drained and somewhat poorly drained Adair and somewhat poorly drained Lamoni soils on the lower parts of the side slopes. These soils are better drained than the Clarinda soil and contain less clay. They make up 5 to 15 percent of the unit.

The Clarinda soil is very slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most of the acreage is used for hay and pasture or is idle land. A few areas are cultivated. This soil is unsuited to cultivated crops because of the slope and a severe hazard of further erosion. It is best suited to small grain and to grasses and legumes for pasture and hay. Establishing a plant cover can be difficult.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, applications of fertilizer, deferred grazing, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

The land capability classification is VIe.

223C2—Rinda silty clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, poorly drained soil is on short, convex side slopes, on

convex nose slopes, and in coves at the upper end of drainageways in the uplands. Areas are long and narrow or irregularly shaped and range from 10 to 50 acres in size.

Typically, the surface layer is very dark gray silty clay loam about 9 inches thick. It is mixed with streaks and pockets of dark grayish brown subsurface material. The subsurface layer is dark grayish brown, friable silty clay loam about 5 inches thick. The subsoil to a depth of more than 60 inches is mottled, very firm clay. The upper part is dark grayish brown and grayish brown, and the lower part is gray. In some small areas the surface layer is mainly grayish brown clay.

Included with this soil in mapping are small areas of the moderately well drained and somewhat poorly drained Armstrong and somewhat poorly drained Bucknell soils on the lower parts of the side slopes. These soils contain less clay than the Rinda soil. They make up 5 to 15 percent of the unit.

The Rinda soil is very slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are cultivated. Unless conservation practices are applied, this soil is poorly suited to intensive row cropping. It is best suited to small grain and to grasses and legumes for hay and pasture (fig. 7). If row crops are grown, wetness is a very serious limitation and further erosion a severe hazard. Erosion can be controlled by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the clayey subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration. In many areas a narrow, seepy band is on the upper part of the side slopes. This band commonly remains wet until midsummer. The soil warms up slowly in the spring and dries out very slowly after periods of rainfall. Planting is delayed in wet years. Tile drainage is not feasible in this very slowly permeable soil.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture and hayland in good condition.

A few areas support native hardwoods. This soil is poorly suited to trees. Equipment should be used only during the drier parts of the year or during winter, when the ground is frozen. Special high flotation equipment can be used for harvesting or woodland management if it is necessary during wet periods. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IVw.

223C3—Rinda silty clay loam, 5 to 9 percent slopes, severely eroded. This moderately sloping, poorly drained soil is on short, convex side slopes, on convex nose slopes, and in coves at the upper end of drainageways in the uplands. Areas are long and narrow or irregularly shaped and range from 4 to 20 acres in size.

Typically, the surface layer is dark grayish brown silty clay loam about 6 inches thick. It is mixed with streaks and pockets of dark brown subsoil material. The subsoil is about 42 inches of very firm, mottled clay. The upper part is dark grayish brown and grayish brown, and the lower part is gray. The substratum to a depth of about 60 inches is gray silty clay. In places the surface layer is silty clay.

Included with this soil in mapping are small areas of the moderately well drained and somewhat poorly drained Armstrong and somewhat poorly drained Bucknell soils on the lower parts of the side slopes. These soils contain less clay than the Rinda soil. They make up 5 to 15 percent of the unit.

The Rinda soil is very slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is low in content of available phosphorus and low or medium in content of available potassium.

Most of the acreage is used as pasture or is idle land. This soil is unsuited to intensive row cropping. It is best suited to small grain and to grasses and legumes

Figure 7.—A pasture in an area of Rinda silty clay loam, 5 to 9 percent slopes, moderately eroded.

for hay and pasture. If row crops are grown, wetness is a very serious limitation and further erosion is a severe hazard. Establishing a plant cover can be difficult.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few areas support native hardwoods. This soil is poorly suited to trees. Equipment should be used only during the drier parts of the year or during winter, when the ground is frozen. Special high flotation equipment can be used for harvesting or woodland management if it is necessary during wet periods. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is VIe.

260—Beckwith silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on narrow or moderately broad divides in the loess-covered uplands. Areas are irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer is about 11 inches of grayish brown, mottled silt loam and silty clay loam. The subsoil is about 34 inches thick. It is grayish brown and mottled. The upper part is very firm silty clay, and the lower part is firm silty clay loam. The substratum to a depth of about 60 inches is grayish brown silty clay loam.

Included with this soil in mapping are small areas of the moderately well drained Weller soils on the more sloping parts of the landscape. These soils make up 5 to 10 percent of the unit.

The Beckwith soil is very slowly permeable. The available water capacity is high, and runoff is slow or very slow. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer. The subsoil is medium in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated or used for hay and pasture. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Surface and subsurface drainage systems are needed because wetness and low soil temperature delay spring planting. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Management can be difficult, however, because this soil is poorly drained and is ponded for brief periods. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

Some areas support native hardwoods. This soil is moderately suited to trees. Equipment should be used only during the drier parts of the year or during winter, when the ground is frozen. Special high flotation equipment can be used for harvesting or woodland management if it is necessary during wet periods. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IIIw.

261—Appanoose silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on narrow or moderately broad flats in the loess-covered uplands. Areas are irregularly shaped and range from 20 to 100 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is grayish brown silt loam about 6 inches thick. The subsoil to a depth of about 60 inches is very firm silty clay grading to friable silty clay loam with increasing depth. It is mottled. The upper part is dark gray, dark grayish brown, and grayish brown, and the lower part is grayish brown and light brownish gray.

Included with this soil in mapping are small areas of the somewhat poorly drained Kniffin soils on the more sloping parts of the landscape. These soils make up 5 to 10 percent of the unit.

The Appanoose soil is very slowly permeable. The available water capacity is moderate, and runoff is very slow. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2.5 to 3.5 percent in the surface layer. The subsoil is medium in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Surface and subsurface drainage systems are needed because wetness and low soil temperature delay spring planting. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Management can be difficult, however, because this soil is poorly drained and is ponded for brief periods. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few areas support native hardwoods. This soil is moderately suited to trees. Equipment should be used only during the drier parts of the year or during winter,

when the ground is frozen. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IIIw.

263—Okaw silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on low stream terraces. Areas are irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. It is mixed with streaks and pockets of light brownish gray subsurface material. The subsurface layer is light brownish gray silt loam about 6 inches thick. The subsoil is about 34 inches thick. It is mottled. The upper part is grayish brown and light brownish gray, very firm silty clay, and the lower part is light brownish gray, firm silty clay loam. The substratum to a depth of about 60 inches is light brownish gray silty clay loam.

Included with this soil in mapping are small areas of Tuskeego soils. These soils are in landscape positions similar to those of the Okaw soil. They have a surface layer that is grayer than that of the Okaw soil. They make up 5 to 10 percent of the unit.

The Okaw soil is very slowly permeable. The available water capacity is high, and runoff is slow. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Row crops can be grown in many years if an adequate drainage system can be installed. Tile drains generally do not work satisfactorily because of a high content of clay in the subsoil. Outlets for tile drains are not readily available in areas where the soil is extensive and at a relatively low elevation. Open ditches, surface drains, land shaping, and bedding can remove surface water. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Management can be difficult, however, because this soil is poorly drained and is ponded for brief periods. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few areas support native hardwoods. This soil is moderately suited to trees. Equipment should be used only during the drier parts of the year or during winter, when the ground is frozen. Special high flotation equipment can be used for harvesting or woodland management if it is necessary during wet periods. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IIIw.

269—Humeston silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on bottom land. It is subject to flooding. Areas are irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is very dark gray silt loam about 7 inches thick. The subsurface layer is very dark gray and dark gray silt loam about 19 inches thick. The subsoil extends to a depth of about 60 inches. The upper part is dark gray, firm silty clay loam, and the lower part is very dark gray and dark gray, mottled, firm silty clay.

Included with this soil in mapping are small areas of Vesser and Zook soils. Vesser soils are in scattered areas throughout the map unit, and Zook soils are in the lower areas on the bottom land. Vesser soils are easier to drain than the Humeston soil, and Zook soils are more fertile. Included soils make up 5 to 15 percent of the unit.

The Humeston soil is very slowly permeable. The available water capacity is high, and runoff is very slow. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 3 to 4 percent in the surface layer. The subsoil is medium in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Row crops can be grown in many years if the soil is adequately drained and protected from floodwater. Tile drains

generally do not work satisfactorily because of a high content of clay in the subsoil and because flooding limits their use in the low areas. Open ditches, surface drains, land shaping, and bedding can remove surface water. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

The land capability classification is IIIw.

273B—Olmitz loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on slightly concave foot slopes. It is downslope from moderately steep or steep soils that formed in clay loam glacial till. Areas are long and narrow and range from 5 to 10 acres in size.

Typically, the surface layer is black loam about 10 inches thick. The subsurface layer is about 20 inches of black loam and very dark grayish brown clay loam. The subsoil to a depth of about 60 inches is mottled, friable clay loam. The upper part is dark brown, and the lower part is brown.

Included with this soil in mapping are small areas of Vesser and Zook soils on the lower parts of the foot slopes. These soils are more poorly drained than the Olmitz soil. Also, Vesser soils contain more silt, Zook soils contain more clay, and both soils contain less sand. Included soils make up 5 to 15 percent of the unit.

The Olmitz soil is moderately permeable. The available water capacity is high, and runoff is medium. The content of organic matter typically is about 3 to 4 percent in the surface layer. The subsoil is very low in content of available phosphorus and low in content of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a moderate hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the less productive subsoil. Returning crop residue to the soil or regularly adding organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

The land capability classification is IIe.

312B—Seymour silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on convex ridgetops and the upper side slopes in the loess-covered uplands. Areas are long and narrow or irregularly shaped and range from 10 to 100 acres in size.

Typically, the surface layer is very dark gray silt loam about 8 inches thick. The subsurface layer is very dark gray silty clay loam about 8 inches thick. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is dark grayish brown, very firm silty clay; the next part is grayish brown, very firm silty clay; and the lower part is light olive gray, friable silty clay loam. In some small areas some of the subsoil is mixed with the surface layer.

Included with this soil in mapping are small areas of Clarinda and Edina soils. These soils are more poorly drained than the Seymour soil. Clarinda soils are on the lower side slopes, and Edina soils are on the less sloping parts of the landscape. Included soils make up 5 to 15 percent of the unit.

The Seymour soil is very slowly permeable. The available water capacity is moderate, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 3 to 4 percent in the surface layer. The subsoil is low in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the clayey subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or

regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

The land capability classification is IIIe.

312B2—Seymour silty clay loam, 2 to 5 percent slopes, moderately eroded. This gently sloping, somewhat poorly drained soil is on convex ridgetops and the upper side slopes in the loess-covered uplands. Areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 7 inches thick. It is mixed with streaks and pockets of dark grayish brown subsoil material. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is dark grayish brown, very firm silty clay; the next part is grayish brown, very firm silty clay and silty clay loam; and the lower part is light olive gray, friable silty clay loam. In some small areas the surface layer is mostly dark grayish brown silty clay.

Included with this soil in mapping are small areas of the poorly drained Clarinda soils on the lower parts of the side slopes above drainageways. These soils make up 5 to 15 percent of the unit.

The Seymour soil is very slowly permeable. The available water capacity is moderate, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is low in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the clayey subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, further erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

The land capability classification is IIIe.

313E2—Gosport silt loam, 9 to 18 percent slopes, moderately eroded. This strongly sloping to moderately steep, moderately well drained soil is on convex side slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 10 to 30 acres in size.

Typically, the surface layer is brown silt loam about 5 inches thick. It is mixed with some streaks and pockets of yellowish brown subsoil material. The subsoil is about 16 inches of yellowish brown, mottled, firm silty clay. Stratified, multicolored clay shale is at a depth of about 21 inches.

Included with this soil in mapping are small areas of Lindley soils on the upper parts of the more stable side slopes. These soils contain less clay than the Gosport soil. They make up 5 to 10 percent of the unit.

The Gosport soil is very slowly permeable. The available water capacity is moderate, and runoff is rapid. The shrink-swell potential is high. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer. The subsoil is very low in content of available phosphorus and low in content of available potassium.

Most areas are used as pasture or woodland. This soil is unsuited to cultivated crops because of the slope and a severe hazard of further erosion. Managing areas that have been cleared for pasture is difficult because of the slope. Erosion is a severe hazard in these areas because reestablishing a plant cover is difficult. Maximum production of grasses and legumes can be achieved if the pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, and adequate livestock watering facilities help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, further erosion is a severe

hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

A few small areas support native hardwoods. This soil is suited to trees. The hazard of further erosion, the slope, and the seedling mortality rate are the main management concerns. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Laying out logging roads and trails on or nearly on the contour helps to control erosion. Because of the slope, operating logging equipment is somewhat hazardous. Special equipment and caution in operating the equipment are needed.

This soil is suited to woodland wildlife habitat. Excluding livestock from wooded areas, constructing water impoundment reservoirs, planting trees and shrubs, and establishing food plots adjacent to the wooded areas help to maintain or improve the habitat.

The land capability classification is VIIe.

313G—Gosport silt loam, 18 to 40 percent slopes. This steep and very steep, moderately well drained soil is on convex side slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 10 to 20 acres in size.

Typically, the surface layer is dark brown silt loam about 3 inches thick. The subsurface layer is dark brown silty clay loam about 3 inches thick. The subsoil is about 18 inches thick. It is dark brown and brown, firm silty clay loam in the upper part and yellowish brown, mottled, firm silty clay in the lower part. Stratified, multicolored clay shale is at a depth of about 24 inches.

Included with this soil in mapping are small areas of Lindley soils on the upper parts of the more stable side slopes. These soils contain less clay than the Gosport soil. They make up 5 to 10 percent of the unit.

The Gosport soil is very slowly permeable. The available water capacity is moderate, and runoff is very rapid. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are used as pasture or woodland. This soil generally is unsuited to cultivated crops because of the slope and a severe hazard of erosion. Managing areas that have been cleared for pasture is difficult because of the slope. Erosion is a severe hazard in these areas because reestablishing a plant cover is difficult. Maximum production of grasses and legumes can be achieved if the pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, and adequate livestock watering facilities help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

Most areas support native hardwoods. This soil is suited to trees. The hazard of erosion, the slope, and the seedling mortality rate are the main management concerns. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Laying out logging roads and trails on or nearly on the contour helps to control erosion. Because of the slope, operating logging equipment is somewhat hazardous. Special equipment and caution in operating the equipment are needed.

This soil is suited to woodland wildlife habitat. Excluding livestock from wooded areas, constructing water impoundment reservoirs, planting trees and shrubs, and establishing food plots adjacent to the wooded areas help to maintain or improve the habitat.

The land capability classification is VIIe.

313G2—Gosport silt loam, 18 to 40 percent slopes, moderately eroded. This steep and very steep, moderately well drained soil is on convex side slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 10 to 40 acres in size.

Typically, the surface layer is brown silt loam about 5 inches thick. It is mixed with some streaks and pockets of yellowish brown subsoil material. The subsoil is about 14 inches of yellowish brown, mottled, firm silty clay. Stratified, multicolored clay shale is at a depth of about 19 inches.

Included with this soil in mapping are small areas of Lindley soils on the upper parts of the more stable side slopes. These soils contain less clay than the Gosport soil. They make up 5 to 10 percent of the unit.

The Gosport soil is very slowly permeable. The available water capacity is moderate, and runoff is very rapid. The shrink-swell potential is high. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are used as pasture or woodland. This soil is unsuited to cultivated crops because of the slope and a severe hazard of further erosion. Managing areas that have been cleared for pasture is difficult because of the slope. Erosion is a severe hazard in these areas

because reestablishing a plant cover is difficult. Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, and adequate livestock watering facilities help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, further erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

A few small areas support native hardwoods. This soil is suited to trees. The hazard of further erosion, the slope, and the seedling mortality rate are the main management concerns. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Laying out logging roads and trails on or nearly on the contour helps to control erosion. Because of the slope, operating logging equipment is somewhat hazardous. Special equipment and caution in operating the equipment are needed.

This soil is suited to woodland wildlife habitat. Excluding livestock from wooded areas, constructing water impoundment reservoirs, planting trees and shrubs, and establishing food plots adjacent to the wooded areas help to maintain or improve the habitat.

The land capability classification is VIIe.

362—Haig silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on broad flats in the loess-covered uplands. Areas are irregularly shaped and range from 30 to 100 acres in size.

Typically, the surface layer is black silt loam about 10 inches thick. The subsurface layer is about 8 inches of very dark gray silty clay loam and silty clay. The subsoil to a depth of about 60 inches is very firm silty clay grading to friable silty clay loam. It is mottled. The upper part is dark gray, the next part is olive gray, and the lower part is light olive gray.

Included with this soil in mapping are small areas of Edina and Grundy soils. Edina soils are in shallow depressions. They contain more clay than the Haig soil and cannot be drained so easily. The somewhat poorly drained Grundy soils are on the more sloping parts of the landscape. Included soils make up 5 to 15 percent of the unit.

The Haig soil is slowly permeable. The available water capacity is high, and runoff is very slow. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 3.5 to 4.5 percent in the surface layer. The subsoil is low in content of available phosphorus and potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain. Surface and subsurface drainage systems are needed because wetness and low soil temperature delay spring planting. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Management can be difficult, however, because this soil is poorly drained and is ponded for brief periods. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, applications of fertilizer, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

The land capability classification is IIw.

364B—Grundy silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on convex ridgetops and the upper side slopes in the loess-covered uplands. Areas are long and narrow or irregularly shaped and range from 30 to 80 acres in size.

Typically, the surface layer is black silt loam about 9 inches thick. The subsurface layer is very dark gray silty clay loam about 3 inches thick. The subsoil is about 40 inches thick. It is mottled and firm. The upper part is dark grayish brown silty clay loam, the next part is dark grayish brown and grayish brown silty clay, and the lower part is olive gray silty clay loam. The substratum to a depth of about 60 inches is olive gray, mottled silty clay loam. In some small areas streaks and pockets of subsoil material are mixed with the surface layer.

Included with this soil in mapping are small areas of the poorly drained Haig soils on the less sloping parts of the landscape. These soils make up 5 to 10 percent of the unit.

The Grundy soil is slowly permeable. The available water capacity is high, and runoff is slow or medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 3 to 4 percent in the surface layer. The subsoil is low in content of available phosphorus and potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a moderate hazard. It can be

controlled by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed in some areas. Cuts for terraces should not expose the clayey subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, erosion is a moderate hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

The land capability classification is IIe.

405—Floris silt loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is on bottom land. It is subject to flooding. Areas are irregularly shaped and range from 5 to 30 acres in size.

Typically, the surface layer is dark brown and dark grayish brown silt loam about 4 inches thick. The substratum to a depth of about 60 inches is stratified and multicolored. The upper part is fine sandy loam, and the lower part is silt loam.

Included with this soil in mapping are small areas of Nodaway soils. These soils are in scattered areas throughout the map unit. They do not contain so much sand as the Floris soil. They make up 5 to 10 percent of the unit.

The Floris soil is moderately permeable. The available water capacity is moderate, and runoff is slow. The soil has a seasonal high water table. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer. The substratum is very low in content of available phosphorus and potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Row crops can be grown in many years if the soil is protected from floodwater. The soil can be somewhat droughty in some years. A system of conservation tillage that leaves crop residue on the surface can conserve moisture. Returning crop residue to the soil or regularly adding other organic material improves fertility.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

The land capability classification is IIw.

423D2—Bucknell silty clay loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, somewhat poorly drained soil is on short, convex side slopes and in coves at the upper end of drainageways in the uplands. Areas are long and irregularly shaped and range from 10 to 60 acres in size.

Typically, the surface layer is very dark gray and very dark grayish brown silty clay loam about 8 inches thick. It is mixed with some streaks and pockets of dark grayish brown subsoil material. The subsoil is about 40 inches thick. The upper part is dark grayish brown and grayish brown, very firm clay; the next part is grayish brown and yellowish brown, very firm clay; and the lower part is yellowish brown, gray, and light olive gray, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown and light olive gray clay loam. In some small areas the surface layer is mainly grayish brown and dark grayish brown clay.

Included with this soil in mapping are small areas of Gara and Rinda soils. The well drained Gara soils are on the lower parts of the side slopes, and the poorly drained Rinda soils are on the upper parts. Included soils make up 5 to 15 percent of the unit.

The Bucknell soil is slowly permeable. The available water capacity is high, and runoff is rapid. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are cultivated or are used for pasture and hay. This soil is poorly suited to intensive row cropping. It is best suited to small grain and to grasses and legumes for hay and pasture. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe

hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few small areas support native hardwoods. This soil is well suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IVe.

423D3—Bucknell silty clay loam, 9 to 14 percent slopes, severely eroded. This strongly sloping, somewhat poorly drained soil is on short, convex side slopes and in coves at the upper end of drainageways in the uplands. Areas are long and irregularly shaped and range from 4 to 10 acres in size.

Typically, the surface layer is dark grayish brown silty clay loam about 5 inches thick. It is mixed with streaks and pockets of grayish brown subsoil material. The subsoil is about 33 inches thick. The upper part is grayish brown and yellowish brown, very firm clay, and the lower part is yellowish brown and gray, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown and light olive gray clay loam. In some areas the surface layer is silty clay.

Included with this soil in mapping are small areas of Gara and Rinda soils. The well drained Gara soils are on the lower parts of the side slopes, and the poorly drained Rinda soils are in the coves of the drainageways. Included soils make up 5 to 15 percent of the unit.

The Bucknell soil is slowly permeable. The available water capacity is high, and runoff is rapid. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 1 to 2 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most of the acreage is used as pasture or is idle land. This soil is unsuited to cultivated crops. If row crops are grown, further erosion is a severe hazard. Past erosion has created small gullies.

This soil is best suited to grasses and legumes for pasture and hay. Establishing a plant cover is difficult. Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few small areas support native hardwoods. This soil is well suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is VIe.

424D2—Lindley-Keswick loams, 9 to 14 percent slopes, moderately eroded. These strongly sloping soils are on short, convex side slopes and convex nose slopes in the uplands. The well drained Lindley soil is on the lower parts of the slopes, and the moderately well drained Keswick soil is on the upper parts. Areas are long and narrow or irregularly shaped and range from 5 to 30 acres in size. They are about 60 percent Lindley soil and 30 percent Keswick soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Lindley soil is dark grayish brown loam about 5 inches thick. It is mixed with streaks and pockets of yellowish brown subsoil material. The subsoil is yellowish brown clay loam about 30 inches thick. It is friable in the upper part and firm and mottled in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Typically, the surface layer of the Keswick soil is dark grayish brown loam about 6 inches thick. It is mixed with streaks and pockets of reddish brown and brown subsurface and subsoil material. The subsoil extends to a depth of 60 inches or more. It is mottled. The upper part is reddish brown and brown, firm clay loam; the next part is yellowish red and brown, very firm clay; and the lower part is strong brown, yellowish brown, and grayish brown, firm clay loam.

Included with these soils in mapping are small areas of Rathbun and Weller soils on the upper side slopes. These included soils contain less sand than the Lindley and Keswick soils. They make up about 10 percent of the unit.

Permeability is moderately slow in the Lindley soil and slow in the Keswick soil. The available water capacity is high in both soils, and runoff is rapid. The Keswick soil has a seasonal high water table. It also has a high shrink-swell potential. The content of organic

matter typically is about 1.5 to 2.5 percent in the surface layer of both soils. The subsoil is very low in content of available phosphorus and potassium.

Most areas are used as pasture. These soils are poorly suited to intensive row cropping. They are best suited to small grain and to grasses and legumes for hay and pasture. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

Some small areas support native hardwoods. These soils are well suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly.

The land capability classification is IVe.

424E2—Lindley-Keswick loams, 14 to 18 percent slopes, moderately eroded. These moderately steep soils are on short, convex side slopes and convex nose slopes in the uplands. The well drained Lindley soil is on the lower parts of the slopes, and the moderately well drained Keswick soil is on the upper parts. Areas are long and narrow or irregularly shaped and range from 5 to 30 acres in size. They are about 60 percent Lindley soil and 30 percent Keswick soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Lindley soil is dark grayish brown loam about 5 inches thick. It is mixed with streaks and pockets of yellowish brown subsoil material. The subsoil is yellowish brown clay loam about 30 inches thick. It is friable in the upper part and firm and mottled in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Typically, the surface layer of the Keswick soil is very dark grayish brown loam about 6 inches thick. It is mixed with streaks and pockets of reddish brown and brown subsurface and subsoil material. The subsoil extends to a depth of 60 inches or more. It is mottled. The upper part is reddish brown and brown, very firm clay loam; the next part is yellowish red and brown, very firm clay; and the lower part is strong brown, yellowish brown, and grayish brown, firm clay loam.

Included with these soils in mapping are small areas of Rathbun and Weller soils. These included soils are on the upper side slopes. They contain less sand than the Lindley and Keswick soils. They make up about 10 percent of the unit.

Permeability is moderately slow in the Lindley soil and slow in the Keswick soil. The available water capacity is high in both soils, and runoff is rapid. The Keswick soil has a seasonal high water table. Also, it has a high shrink-swell potential. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer of both soils. The subsoil is very low in content of available phosphorus and potassium.

Most areas are used as pasture or woodland. These soils are unsuited to cultivated crops because of the slope and a severe hazard of further erosion. In areas that have been cleared for use as pasture and hayland, good management is needed because further erosion is a severe hazard and reestablishing a plant cover is difficult. Tilling the soils increases the susceptibility to erosion. As a result, the grasses and legumes should be interseeded into the existing sod. Operating farm machinery on these moderately steep soils can be difficult and dangerous. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture and hayland in good condition.

Some areas support native hardwoods. These soils are well suited to trees. Carefully locating skid trails and logging roads reduces the hazard of erosion. Laying out the trails or roads on or nearly on the contour also helps to control erosion. Because of the slope, operating equipment is somewhat hazardous. Special equipment and caution in operating the equipment are needed. Seedling mortality is a problem. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density.

These soils are suited to woodland wildlife habitat. Excluding livestock from wooded areas, constructing water impoundment reservoirs, planting trees and

shrubs, and establishing food plots adjacent to the wooded areas help to maintain or improve the habitat.

The land capability classification is VIe.

425C—Keswick loam, 5 to 9 percent slopes. This moderately sloping, moderately well drained soil is on short, convex nose slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is very dark gray loam about 3 inches thick. The subsurface layer is grayish brown and brown loam about 8 inches thick. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is reddish brown and brown, firm clay loam; the next part is yellowish red and brown, very firm clay; and the lower part is yellowish brown, strong brown, and grayish brown, firm clay loam. In some small areas streaks and pockets of subsoil material are mixed with the surface layer.

Included with this soil in mapping are small areas of Rathbun, Weller, and Lindley soils. Rathbun and Weller soils formed in loess. They are on the upper parts of the side slopes. Lindley soils are lower on the landscape than the Keswick soil. Also, they contain less clay. Included soils make up 5 to 15 percent of the unit.

The Keswick soil is slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is nigh. The content of organic matter is about 2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are used for hay, pasture, or woodland. Some of the acreage is cultivated. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If row crops are grown, erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the clayey subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

Many small areas support native hardwoods. This soil is well suited to trees. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IIIe.

425C2—Keswick loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on short, convex nose slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown loam about 6 inches thick. It is mixed with streaks and pockets of reddish brown and brown subsurface and subsoil material. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is reddish brown and brown, firm clay loam; the next part is yellowish red and brown, very firm clay; and the lower part is strong brown, yellowish brown, and grayish brown, firm clay loam. In some small areas the surface layer is mainly strong brown or reddish brown clay loam.

Included with this soil in mapping are small areas of Rathbun, Weller, and Lindley soils. Rathbun and Weller soils formed in loess. They are on the upper parts of the side slopes. Lindley soils are lower on the landscape than the Keswick soil. Also, they contain less clay. Included soils make up 5 to 15 percent of the unit.

The Keswick soil is slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter is about 1.5 to 2.5 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Many areas are cultivated. Some of the acreage is used for hay and pasture. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the clayey subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, further erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

Many small areas support native hardwoods. This soil is well suited to trees. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IIIe.

425D—Keswick loam, 9 to 14 percent slopes. This strongly sloping, moderately well drained soil is on short, convex side slopes and convex nose slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 10 to 50 acres in size.

Typically, the surface layer is very dark gray loam about 3 inches thick. The subsurface layer is grayish brown and brown loam about 8 inches thick. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is reddish brown and brown, firm clay loam; the next part is yellowish red and brown, very firm clay; and the lower part is yellowish brown and strong brown, firm clay loam. In some small areas streaks and pockets of subsoil material are mixed with the surface layer. In other small areas the surface layer is mainly strong brown clay loam.

Included with this soil in mapping are small areas of Rathbun, Weller, and Lindley soils. Rathbun and Weller soils formed in loess. They are on the upper parts of the side slopes. Lindley soils are lower on the landscape than the Keswick soil. Also, they contain less clay. Included soils make up 5 to 15 percent of the unit.

The Keswick soil is slowly permeable. The available water capacity is high, and runoff is rapid. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are used for hay, pasture, or woodland. This soil is poorly suited to intensive row cropping. It is best suited to small grain and to grasses and legumes for hay and pasture. If row crops are grown, erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

Many small areas support native hardwoods. This soil is well suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IVe.

425D2—Keswick loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained soil is on short, convex side slopes and convex nose slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 10 to 100 acres in size.

Typically, the surface layer is dark grayish brown loam about 6 inches thick. It is mixed with streaks and pockets of reddish brown and brown subsurface and subsoil material. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is reddish brown and brown, firm clay loam; the next part is yellowish red and brown, very firm clay; and the lower part is strong brown, yellowish brown, and grayish brown, firm clay loam. In some small areas the surface layer is mainly strong brown or reddish brown clay loam.

Included with this soil in mapping are small areas of Rathbun, Weller, and Lindley soils. Rathbun and Weller soils formed in loess. They are on the upper parts of the side slopes. Lindley soils are lower on the landscape than the Keswick soil. Also, they contain less clay. Included soils make up 5 to 15 percent of the unit.

The Keswick soil is slowly permeable. The available water capacity is high, and runoff is rapid. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are used for hay, pasture, or woodland. Some of the acreage is cultivated. This soil is poorly suited to intensive row cropping. It is best suited to small grain and to grasses and legumes for hay and pasture. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, further erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

Many small areas support native hardwoods. This soil is well suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IVe.

425D3—Keswick clay loam, 9 to 14 percent slopes, severely eroded. This strongly sloping, moderately well drained soil is on short, convex side slopes and convex nose slopes in the uplands. Areas are long and narrow or irregularly shaped and commonly range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown clay loam about 4 inches thick. It is mixed with streaks and pockets of reddish brown subsoil material. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is brown and reddish brown, firm clay loam; the next part is yellowish red and brown, very firm clay; and the lower part is yellowish brown, strong brown, grayish brown, and gray, firm clay loam.

Included with this soil in mapping are small areas of Rathbun, Weller, and Lindley soils. Rathbun and Weller soils formed in loess. They are on the upper parts of the side slopes. Lindley soils are lower on the landscape than the Keswick soil. Also, they contain less clay. Included soils make up 5 to 15 percent of the unit.

The Keswick soil is slowly permeable. The available water capacity is moderate, and runoff is rapid. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 1 to 2 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most of the acreage is used as pasture or is idle land. This soil is unsuited to row crops. Past erosion has created small gullies.

This soil is best suited to grasses and legumes for hay and pasture. Establishing a plant cover is difficult. Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, weed and brush control, adequate livestock watering facilities, applications of fertilizer, deferred grazing, and restricted use during wet periods help to keep the pasture or hayland in good condition.

Some small areas support native hardwoods. This soil is well suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is VIe.

430—Ackmore silt loam, 0 to 2 percent slopes. This nearly level, poorly drained or somewhat poorly drained soil is on bottom land. It is subject to flooding. Areas are irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is very dark gray silt loam about 9 inches thick. The substratum is about 22 inches of stratified, multicolored, mottled silt loam. Below this to a depth of about 60 inches is a buried layer of black and very dark gray silty clay loam. In places the surface layer and substratum have strata of sandy loam.

Included with this soil in mapping are small areas of the moderately well drained Nodaway soils. These soils are in scattered areas throughout the map unit. They are not underlain by a buried soil. They make up 5 to 10 percent of the unit.

The Ackmore soil is moderately permeable. The available water capacity is high, and runoff is slow. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 1 to 3 percent in the surface layer. The substratum is low in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Row crops can be grown in many years if adequate protection against flooding can be provided. In many places diversion terraces are needed on the adjacent foot slopes to protect the soil from the runoff from the higher areas.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few small areas support native hardwoods. This soil is well suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly.

The land capability classification is IIw.

451D2—Caleb loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained soil is on the convex side slopes of high stream benches. Areas are long and narrow or irregularly shaped and range from 5 to 30 acres in size.

Typically, the surface layer is very dark gray loam about 8 inches thick. It is mixed with streaks and pockets of brown subsoil material. The subsoil is about 46 inches thick. The upper part is brown, friable loam; the next part is dark yellowish brown, friable and very friable loam; and the lower part is yellowish brown and light yellowish brown, very friable and loose sandy loam and loamy sand. The substratum to a depth of about 60 inches is yellowish brown sandy clay loam. In some small areas it is mainly brown loam. In other small areas the surface layer is silt loam.

Included with this soil in mapping are small areas of the moderately well drained or somewhat poorly drained Mystic and Pershing soils. Mystic soils have a strong brown, clayey subsoil. They are on the upper parts of the side slopes. Pershing soils formed in loess. They are on narrow, convex ridgetops upslope from the Caleb soil. Included soils make up 5 to 15 percent of the unit.

The Caleb soil is moderately permeable. The available water capacity is moderate, and runoff is rapid. The soil has a seasonal high water table. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and low in content of available potassium.

This soil is used mainly for pasture and hay. It is poorly suited to intensive row cropping. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, grassed waterways, a cropping sequence that includes grasses and legumes, and diversion terraces. A combination of these measures is needed. The terraces should be constructed on the lowest part of the side slopes so that the adjacent soils on the foot slopes are protected from runoff. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few small areas support native hardwoods. This soil is well suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly.

The land capability classification is IVe.

452C2—Lineville silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained or somewhat poorly drained soil is on narrow, convex nose slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 5 to 10 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 6 inches thick. It is mixed with streaks and pockets of brown subsurface material. The subsurface layer is brown silt loam about 4 inches thick. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is brown, friable silty clay loam and clay loam; the next part is grayish brown and yellowish brown, friable loam and clay loam; and the lower part is strong brown and yellowish brown, firm clay loam.

Included with this soil in mapping are small areas of Armstrong and Kniffin soils. Armstrong soils are on side slopes and the lower parts of ridgetops. They contain more clay in the subsoil than the Lineville soil. Kniffin soils formed in loess. They are upslope from the Lineville soil. Included soils make up 5 to 15 percent of the unit.

The Lineville soil is slowly permeable. The available

water capacity is high, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are used for hay and pasture. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a severe hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the less productive subsoil. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, adequate livestock watering facilities, weed and brush control, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few small areas support native hardwoods. This soil is moderately suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly.

The land capability classification is IIIe.

453—Tuskeego silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on low stream terraces. Areas are irregularly shaped and range from 5 to 25 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 6 inches thick. The subsurface layer is dark grayish brown, grayish brown, and light brownish gray silt loam about 15 inches thick. The subsoil to a depth of about 60 inches is gray and dark gray and is mottled. The upper part is firm and very firm silty clay loam and silty clay, and the lower part is firm silty clay loam.

Included with this soil in mapping are small areas of Coppock soils. These soils are in landscape positions similar to those of the Tuskeego soil. They contain less clay in the subsoil than the Tuskeego soil. They make up 5 to 10 percent of the unit.

The Tuskeego soil is very slowly permeable. The available water capacity is high, and runoff is very slow. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 3 to 4 percent in the surface layer. The subsoil is low in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Row crops can be grown in many years if a drainage system can be installed. Tile drains generally do not work satisfactorily because of a high content of clay in the subsoil. Outlets for tile drains are not readily available in areas where the soil is extensive and at a relatively low elevation. Open ditches, surface drains, land shaping, and bedding can remove surface water. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few areas support native hardwoods. This soil is moderately suited to trees. Equipment should be used only during the drier parts of the year or during winter, when the ground is frozen. Special high flotation equipment can be used for harvesting or woodland management if it is necessary during wet periods. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IIIw.

484—Lawson silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on bottom land. It is subject to flooding. Areas are long and narrow or irregularly shaped and range from 10 to 100 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is very dark grayish brown and very dark gray silt loam about 26 inches thick. The substratum to a depth of about 60 inches is very dark grayish brown and dark

grayish brown silt loam. In places the surface layer or subsurface layer has thin strata of sandy loam.

Included with this soil in mapping are small areas of Amana and Nodaway soils. These soils are not so black as the Lawson soil. Also, Nodaway soils are more stratified. Included soils make up about 5 to 15 percent of the unit.

The Lawson soil is moderately permeable. The available water capacity is very high, and runoff is slow. The soil has a seasonal high water table. The content of organic matter typically is about 4 to 6 percent in the surface layer. The subsoil is medium in content of available phosphorus and low in content of available potassium.

Most areas are cultivated or used for hay and pasture. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Row crops can be grown in many years if the soil is adequately drained and protected from floodwater. A subsurface drainage system is needed. In many places diversion terraces on the adjacent foot slopes help to control the runoff from the higher areas. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few small areas support native hardwoods. This soil is well suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly.

The land capability classification is IIw.

520—Coppock silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained or poorly drained soil is on the higher parts of bottom land. It is subject to flooding. Areas are irregularly shaped and range from 5 to 30 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is dark grayish brown and grayish brown, mottled silt loam about 18 inches thick. The subsoil to a depth of about 60 inches is dark grayish brown, mottled silty clay loam. In places the surface layer is about 12 inches thick.

Included with this soil in mapping are small areas of Tuskeego soils. These soils are in landscape positions similar to those of the Coppock soil. They contain more clay in the subsoil than the Coppock soil and are more difficult to drain. Included soils make up 5 to 10 percent of the unit.

The Coppock soil is moderately permeable. The available water capacity is high, and runoff is slow. The soil has a seasonal high water table. The content of organic matter typically is about 2.5 to 3.5 percent in the surface layer. The subsoil is medium in content of available phosphorus and low in content of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Row crops can be grown in many years if the soil is adequately drained and protected from floodwater. A subsurface drainage system is needed. In many areas diversion terraces are needed to protect the soil from the runoff from the higher surrounding areas. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

A few small areas support native hardwoods. This soil is moderately suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly.

The land capability classification is IIw.

520B—Coppock silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained or poorly drained soil is on foot slopes and alluvial fans. Areas are irregularly shaped and range from 5 to 10 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is dark grayish brown and grayish brown silt loam about 18 inches thick. The subsoil to a depth of about 60 inches is dark grayish brown, mottled silty clay loam. In places the surface layer is about 12 inches thick.

Included with this soil in mapping are small areas of Tuskeego soils. These soils are in landscape positions similar to those of the Coppock soil. They contain more clay in the subsoil than the Coppock soil and are more difficult to drain. Included soils make up 5 to 10 percent of the unit.

The Coppock soil is moderately permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The content of organic matter typically is about 2.5 to 3.5 percent in

the surface layer. The subsoil is medium in content of available phosphorus and low in content of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Row crops can be grown in many years if the soil is adequately drained. A subsurface drainage system is needed. In many areas diversion terraces are needed to protect the soil from the runoff from the higher surrounding areas. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

A few small areas support native hardwoods. This soil is moderately suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly.

The land capability classification is IIw.

531B—Kniffin silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on convex ridgetops and short, convex side slopes in the loess-covered uplands. Areas are long and narrow or irregularly shaped and range from 5 to 80 acres in size.

Typically, the surface layer is very dark gray silt loam about 8 inches thick. The subsurface layer is dark grayish brown silty clay loam about 3 inches thick. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is dark grayish brown and grayish brown, firm and very firm silty clay; the next part is olive gray, firm silty clay loam; and the lower part is light olive gray, firm and friable silty clay loam. In some small areas streaks and pockets of subsoil material are mixed with the surface layer.

Included with this soil in mapping are small areas of the poorly drained Appanoose soils on the less sloping parts of the landscape. These soils make up 5 to 10 percent of the unit.

The Kniffin soil is very slowly permeable. The available water capacity is moderate, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2.5 to 3.5 percent in the surface layer. The subsoil is medium in content of available phosphorus and low in content of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a severe hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the less productive subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few areas support native hardwoods. This soil is moderately suited to trees. Equipment should be used only during the drier parts of the year or during winter, when the ground is frozen. Seedling mortality is a problem. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density.

The land capability classification is IIIe.

531C—Kniffin silt loam, 5 to 9 percent slopes. This moderately sloping, somewhat poorly drained soil is on narrow, convex ridgetops and short, convex side slopes in the loess-covered uplands. Areas are long and narrow or irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is very dark gray silt loam about 8 inches thick. The subsurface layer is dark grayish brown silty clay loam about 3 inches thick. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is dark grayish brown, firm and very firm silty clay; the next part is olive gray, firm silty clay loam; and the lower part is light olive gray, firm and friable silty clay loam. In some small areas streaks and pockets of subsoil material are mixed with the surface layer.

Included with this soil in mapping are small areas of the poorly drained Rinda soils on the lower parts of the side slopes. These soils contain more clay in the subsoil than the Kniffin soil. They make up 5 to 15 percent of the unit.

The Kniffin soil is very slowly permeable. The available water capacity is moderate, and runoff is medium. The soil has a seasonal high water table. The

shrink-swell potential is high. The content of organic matter is about 2.5 to 3.5 percent in the surface layer. The subsoil is medium in content of available phosphorus and low in content of available potassium.

Most areas are used for hay and pasture. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a severe hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the less productive subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few areas support native hardwoods. This soil is moderately suited to trees. Equipment should be used only during the drier parts of the year or during winter, when the ground is frozen. Seedling mortality is a problem. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density.

The land capability classification is IIIe.

531C2—Kniffin silty clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, somewhat poorly drained soil is on narrow, convex ridgetops and short, convex side slopes in the loess-covered uplands. Areas are long and narrow or irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is very dark gray silty clay loam about 6 inches thick. It is mixed with streaks and pockets of dark grayish brown subsoil material. The subsoil is about 50 inches thick. It is mottled. The upper part is dark grayish brown, very firm silty clay; the next part is grayish brown, very firm silty clay; and the lower part is olive gray, firm silty clay loam. The substratum to a depth of about 60 inches is light olive gray silty clay loam. In some small areas the surface layer is mainly dark grayish brown silty clay.

Included with this soil in mapping are small areas of the moderately well drained and somewhat poorly drained Armstrong and poorly drained Rinda soils on the lower parts of the side slopes. These soils make up 5 to 15 percent of the unit.

The Kniffin soil is very slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is medium in content of available phosphorus and low in content of available potassium.

Most areas are cultivated or are used for pasture and hay. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a severe hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the less productive subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

This soil is moderately suited to trees. Equipment should be used only during the drier parts of the year or during winter, when the ground is frozen. Seedling mortality is a problem. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density.

The land capability classification is IIIe.

532B—Rathbun silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on convex ridgetops and short, convex side slopes in the loess-covered uplands. Areas are long and narrow or

irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is grayish brown silt loam about 7 inches thick. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is brown, friable silty clay loam and dark grayish brown, very firm silty clay; the next part is grayish brown, firm silty clay; and the lower part is light brownish gray, firm and friable silty clay loam. In some small areas streaks and pockets of subsoil material are mixed with the surface layer.

Included with this soil in mapping are small areas of the poorly drained Beckwith soils on the less sloping parts of the landscape. These soils make up 5 to 10 percent of the unit.

The Rathbun soil is very slowly permeable. The available water capacity is moderate, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is medium in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated or used as pasture or woodland. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a severe hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the less productive subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

Some areas support native hardwoods. This soil is moderately suited to trees. Seedling mortality is a problem. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density.

The land capability classification is IIIe.

532C—Rathbun silt loam, 5 to 9 percent slopes. This moderately sloping, somewhat poorly drained soil is on narrow, convex ridgetops and short, convex side slopes in the loess-covered uplands. Areas are long and narrow or irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is grayish brown silt loam about 7 inches thick. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is grayish brown and yellowish brown, very firm silty clay; the next part is grayish brown, firm silty clay; and the lower part is light brownish gray, firm and friable silty clay loam. In some small areas streaks and pockets of subsoil material are mixed with the surface layer.

Included with this soil in mapping are small areas of the moderately well drained Keswick and poorly drained Ashgrove soils. These soils are on the lower parts of the slopes. They contain more clay than the Rathbun soil. They make up 5 to 15 percent of the unit.

The Rathbun soil is very slowly permeable. The available water capacity is moderate, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is medium in content of available phosphorus and very low in content of available potassium.

Most areas are used as pasture or woodland. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a severe hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the less productive subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates,

pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

Most areas support native hardwoods. This soil is moderately suited to trees. Seedling mortality is a problem. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density.

The land capability classification is IIIe.

532C2—Rathbun silty clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, somewhat poorly drained soil is on narrow, convex ridgetops and short, convex side slopes in the loess-covered uplands. Areas are long and narrow or irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is brown silty clay loam about 6 inches thick. It is mixed with streaks and pockets of yellowish brown subsoil material. The subsoil is about 45 inches thick. It is mottled. The upper part is dark grayish brown and yellowish brown, very firm silty clay; the next part is grayish brown, firm silty clay; and the lower part is light brownish gray, firm and friable silty clay loam. The substratum to a depth of about 60 inches is light brownish gray silt loam. In some small areas the surface layer is mainly yellowish brown silty clay.

Included with this soil in mapping are small areas of the moderately well drained Keswick and poorly drained Ashgrove soils. These soils are on the lower parts of the slopes. They contain more clay than the Rathbun soil. They make up 5 to 15 percent of the unit.

The Rathbun soil is very slowly permeable. The available water capacity is moderate, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer. The subsoil is medium in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated or used for pasture and hay. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a severe hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the less productive subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few areas support native hardwoods. This soil is moderately suited to trees. Seedling mortality is a problem. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density.

The land capability classification is IIIe.

587—Chequest silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on bottom land. It is subject to flooding. Areas are irregularly shaped and range from 5 to 70 acres in size.

Typically, the surface layer is very dark gray silty clay loam about 8 inches thick. The subsurface layer also is very dark gray silty clay loam. It is about 6 inches thick. The subsoil to a depth of about 60 inches is dark gray, gray, and dark brown, mottled, firm silty clay loam.

Included with this soil in mapping are small areas of Vesser and Zook soils. Vesser soils are in the slightly higher positions on the landscape, and Zook soils are in the slightly lower positions. Vesser soils contain less clay than the Chequest soil, and Zook soils have a thicker dark surface soil. Included soils make up 5 to 15 percent of the unit.

The Chequest soil is moderately slowly permeable. The available water capacity is high, and runoff is slow. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 3 to 4 percent in the surface layer. The subsoil is medium in content of available phosphorus and low in content of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Row crops can be grown in many years if the soil is adequately drained and protected from floodwater. Surface and subsurface

drainage systems are needed. In many areas diversion terraces are needed to protect the soil from the runoff from the higher surrounding areas. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

The land capability classification is IIw.

592C2—Mystic silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained or somewhat poorly drained soil is on the convex side slopes of high stream benches. Areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. It is mixed with streaks and pockets of yellowish brown subsurface material. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is dark brown, friable and firm clay loam and clay; the next part is brown, firm clay; and the lower part is yellowish brown, firm sandy clay loam and sandy loam. In some small areas the surface layer is mainly dark brown clay loam.

Included with this soil in mapping are small areas of Caleb and Pershing soils. Caleb soils are on the lower side slopes. They contain less clay than the Mystic soil. Pershing soils formed in loess. They are on narrow, convex ridgetops upslope from the Mystic soil. Included soils make up 5 to 15 percent of the unit.

The Mystic soil is slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and low in content of available potassium.

Most areas are cultivated or used for pasture and hay. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the clayey subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few small areas support native hardwoods. This soil is well suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly.

The land capability classification is IIIe.

592D2—Mystic silt loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained or somewhat poorly drained soil is on the convex side slopes of high stream benches. Areas are long and narrow or irregularly shaped and range from 5 to 30 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. It is mixed with streaks and pockets of yellowish brown subsurface material. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is dark brown, friable and firm clay loam and clay; the next part is brown, firm clay; and the lower part is yellowish brown, firm and friable sandy clay loam and sandy loam. In some small areas the surface layer is mainly dark brown loam.

Included with this soil in mapping are small areas of Caleb and Pershing soils. Caleb soils are on the lower side slopes. They contain less clay than the Mystic soil. Pershing soils formed in loess. They are on narrow, convex ridgetops upslope from the Mystic soil. Included soils make up 5 to 15 percent of the unit.

The Mystic soil is slowly permeable. The available water capacity is high, and runoff is rapid. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about

2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and low in content of available potassium.

Most areas are cultivated or used for pasture and hay. This soil is poorly suited to intensive row cropping. It is better suited to small grain and to grasses and legumes for hay and pasture. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, grassed waterways, a cropping sequence that includes grasses and legumes, and diversion terraces. A combination of these measures is needed. The terraces should be built on the lowest part of the side slopes so that the adjacent soils on foot slopes are protected from runoff. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few small areas support native hardwoods. This soil is well suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly.

The land capability classification is IVe.

592D3—Mystic clay loam, 9 to 14 percent slopes, severely eroded. This strongly sloping, moderately well drained or somewhat poorly drained soil is on the convex side slopes of high stream benches. Areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown clay loam about 5 inches thick. It is mixed with streaks and pockets of dark brown subsoil material. The subsoil is about 50 inches thick. It is mottled and firm. The upper part is dark brown clay, the next part is brown clay, and the lower part is yellowish brown sandy clay loam. The substratum to a depth of about 60 inches is yellowish brown loam and sandy loam.

Included with this soil in mapping are small areas of Caleb and Pershing soils. Caleb soils are on the lower side slopes. They contain less clay than the Mystic soil. Pershing soils formed in loess. They are on narrow, convex ridgetops upslope from the Mystic soil. Included soils make up 5 to 15 percent of the unit.

The Mystic soil is slowly permeable. The available water capacity is high, and runoff is rapid. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is 1.5 to 2.5 percent in the surface layer. The subsoil is very low in content of available phosphorus and low in content of available potassium.

Most of the acreage is used as pasture or is idle land. This soil is unsuited to row crops. Past erosion has created small gullies.

This soil is best suited to grasses and legumes for hay and pasture. Establishing a plant cover is difficult. Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few small areas support native hardwoods. This soil is well suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly.

The land capability classification is VIe.

594C2—Galland loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained or somewhat poorly drained soil is on the convex side slopes of high stream benches. Areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown loam about 10 inches thick. It is mixed with streaks and pockets of brown clay from the subsoil. The subsoil is about 36 inches thick. It is mottled. The upper part is brown and strong brown, friable and firm clay, and the lower part is brown, yellowish brown, and light gray, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, gray, and strong brown loam. In some small areas the surface layer is mainly dark grayish brown clay.

Included with this soil in mapping are small areas of the moderately well drained Douds and Weller soils. Douds soils are on the lower side slopes. They contain less clay than the Galland soil. Weller soils formed in

loess. They are on narrow, convex ridgetops upslope from the Galland soil. Included soils make up 5 to 15 percent of the unit.

The Galland soil is slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are cultivated or used for pasture and hay. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, grassed waterways, and a cropping sequence that includes grasses and legumes. Cuts for terraces should not expose the clayey subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

This soil is moderately suited to trees. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IIIe.

594D2—Galland loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained or somewhat poorly drained soil is on the convex side slopes of high stream benches. Areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown loam about 10 inches thick. It is mixed with streaks and pockets of brown clay from the subsoil. The subsoil is about 36 inches thick. It is mottled. The upper part is brown and strong brown, friable and firm clay, and the lower part is brown, yellowish brown, and light gray, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, strong brown, and gray loam. In some small areas the surface layer is mainly dark grayish brown clay.

Included with this soil in mapping are small areas of the moderately well drained Douds and Weller soils. Douds soils are on the lower side slopes. They contain less clay than the Galland soil. Weller soils formed in loess. They are on narrow, convex ridgetops upslope from the Galland soil. Included soils make up 5 to 10 percent of the unit.

The Galland soil is slowly permeable. The available water capacity is high, and runoff is rapid. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are cultivated or used for pasture and hay. This soil is poorly suited to intensive row cropping. It is best suited to small grain and to grasses and legumes for hay and pasture. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, grassed waterways, a cropping sequence that includes grasses and legumes, and diversion terraces. A combination of these measures is needed. The terraces should be built on the lower parts of the side slopes so that the adjacent soils on foot slopes are protected from runoff. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

This soil is moderately suited to trees. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods

Figure 8.—An area of Nodaway-Amana silt loams, 0 to 2 percent slopes, along the Fox River. These soils formed in alluvium deposited by the stream. Sandbars are commonly adjacent to the stream.

that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IVe.

715—Nodaway-Amana silt loams, 0 to 2 percent slopes. These nearly level soils are on bottom land near the Fox River and Soap Creek (fig. 8). They are subject to flooding. The moderately well drained Nodaway soil is commonly next to the present or abandoned stream channels and has received recent deposits of sediment. The somewhat poorly drained Amana soil is in the somewhat higher areas near the abandoned stream channels. Areas are long and narrow or irregularly shaped and range from 10 to more than 100 acres in size. They are about 50 percent Nodaway soil and 35 percent Amana soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Nodaway soil is very dark grayish brown silt loam about 8 inches thick. The substratum to a depth of about 60 inches is stratified dark grayish brown, dark brown, grayish brown, and brown silt loam. In some areas the surface layer is loam, silty clay loam, or sandy loam.

Typically, the surface layer of the Amana soil is very dark gray silt loam about 9 inches thick. The subsurface

layer is about 7 inches of very dark gray silt loam. The subsoil is about 37 inches thick. It is friable and mottled. It is dark grayish brown silty clay loam in the upper part and dark grayish brown and grayish brown silt loam in the lower part. The substratum to a depth of about 60 inches is dark grayish brown, mottled loam.

Included with these soils in mapping are small areas of the somewhat poorly drained or poorly drained Ackmore and moderately well drained Floris soils. These included soils are in scattered areas throughout the map unit. Ackmore soils contain more clay in the subsoil than the Nodaway and Amana soils, and Floris soils contain more sand in the surface layer. Included soils make up about 15 percent of the unit.

The Nodaway and Amana soils are moderately permeable. The available water capacity is very high, and runoff is slow. The soils have a seasonal high water table. The content of organic matter typically is about 2 to 3 percent in the surface layer of the Nodaway soil and about 4 to 6 percent in the surface layer of the Amana soil. The subsoil of the Nodaway soil is medium in content of available phosphorus and potassium. The subsoil of the Amana soil is medium in content of available phosphorus and low in content of available potassium.

Most areas are cultivated. These soils are well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Row crops can be grown in many years if the soils are protected from floodwater. A subsurface drainage system may be needed in some of the lower areas. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few small areas support native hardwoods. These soils are well suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly.

The land capability classification is IIw.

730B—Nodaway-Cantril complex, 0 to 5 percent slopes. These nearly level to gently sloping soils are on narrow stream bottoms and narrow foot slopes. The moderately well drained Nodaway soil is near drainageways. It is subject to flooding. The somewhat poorly drained Cantril soil is on the narrow foot slopes. Areas are long and narrow and range from 10 to more than 100 acres in size. They are about 60 percent Nodaway soil and 30 percent Cantril soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Nodaway soil is very dark grayish brown silt loam about 8 inches thick. The substratum to a depth of about 60 inches is stratified dark grayish brown, dark brown, grayish brown, and brown silt loam. In some areas the surface layer is loam, silty clay loam, or sandy loam.

Typically, the surface layer of the Cantril soil is very dark gray loam about 8 inches thick. The subsurface layer is dark grayish brown loam about 15 inches thick. The subsoil is about 30 inches of dark grayish brown and dark brown, mottled clay loam. The upper part is friable, and the lower part is firm. The substratum to a depth of about 60 inches is dark grayish brown, mottled clay loam. In some small areas the very dark gray surface soil is more than 10 inches thick. In other small areas the surface layer is grayish brown loam overwash as much as 8 inches thick.

Included with these soils in mapping are small areas of the poorly drained Zook and Vesser soils. Vesser soils are on the higher parts of the narrow bottom land. Zook soils are in depressions. Included soils make up about 10 percent of the unit.

The Nodaway and Cantril soils are moderately permeable. The available water capacity is high in the Cantril soil and very high in the Nodaway soil. Runoff is slow or medium on both soils. The soils have a seasonal high water table. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil of the Cantril soil is low in content of available phosphorus and potassium, and the subsoil of the Nodaway soil is medium in content of available phosphorus and potassium.

Most areas are used for pasture, hay, woodland, or wildlife habitat. These soils are moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In some areas row crops can be grown in many years if the soils are protected from floodwater. Diversion terraces are needed to protect the soils from the runoff from the higher surrounding areas. In many areas farming is not feasible.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use

during wet periods help to keep the pasture or hayland in good condition. Interseeding the grasses and legumes into the existing sod eliminates the need for plowing when a seedbed is prepared.

Many areas support native hardwoods. These soils are well suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly.

The land capability classification is IIIw.

792C—Armstrong loam, 5 to 9 percent slopes. This moderately sloping, moderately well drained or somewhat poorly drained soil is on short, convex side slopes, narrow, convex ridgetops, and convex nose slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is very dark gray loam about 8 inches thick. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is dark grayish brown, friable loam; the next part is brown, very firm clay; and the lower part is yellowish brown, firm clay loam. In some small areas some of the subsoil is mixed with the surface layer.

Included with this soil in mapping are small areas of Kniffin, Pershing, and Rinda soils. These soils are on the upper slopes. Kniffin and Pershing soils contain less sand than the Armstrong soil, and Rinda soils are more poorly drained. Included soils make up 5 to 15 percent of the unit.

The Armstrong soil is slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table and has seepy spots during wet periods. The shrink-swell potential is high. The content of organic matter typically is about 2.5 to 3.5 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are used for hay and pasture. Some of the acreage is cultivated. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If row crops are grown, erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the clayey subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

A few small areas support native hardwoods. This soil is moderately suited to trees. Seedling mortality is a problem. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density.

The land capability classification is IIIe.

792C2—Armstrong loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained or somewhat poorly drained soil is on short, convex side slopes, narrow, convex ridgetops, and convex nose slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown loam about 7 inches thick. It is mixed with streaks and pockets of brown subsoil material. The subsoil is about 42 inches thick. The upper part is brown, mottled, very firm clay, and the lower part is yellowish brown, firm clay loam that has red mottles. The substratum to a depth of about 60 inches is yellowish brown, mottled loam. In some small areas the surface layer is mainly dark brown clay loam.

Included with this soil in mapping are small areas of Kniffin, Pershing, and Rinda soils. These soils are on the upper slopes. Kniffin and Pershing soils contain less sand than the Armstrong soil, and Rinda soils are more poorly drained. Included soils make up 5 to 15 percent of the unit.

The Armstrong soil is slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table and has seepy spots during wet periods. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Many areas are cultivated. Some of the acreage is used for hay and pasture. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop

residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the clayey subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, further erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

A few small areas support native hardwoods. This soil is moderately suited to trees. Seedling mortality is a problem. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density.

The land capability classification is IIIe.

792C3—Armstrong clay loam, 5 to 9 percent slopes, severely eroded. This moderately sloping, moderately well drained or somewhat poorly drained soil is on short, convex side slopes, narrow, convex ridgetops, and convex nose slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is dark brown clay loam about 5 inches thick. Generally, plowing has mixed mainly brown subsoil material into the plow layer. The subsoil is about 40 inches thick. The upper part is brown, very firm clay that has red mottles, and the lower part is yellowish brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled loam.

Included with this soil in mapping are small areas of Kniffin, Pershing, and Rinda soils. These soils are on the upper slopes. Kniffin and Pershing soils contain less sand than the Armstrong soil, and Rinda soils are more poorly drained. Included soils make up 5 to 15 percent of the unit.

The Armstrong soil is slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table and has seepy spots during wet periods. The shrink-swell potential is high. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Many areas are cultivated. Some of the acreage is used for hay and pasture. This soil is poorly suited to intensive row cropping and small grain. It is better suited to grasses and legumes for hay and pasture. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces can further expose the clayey subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, further erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

A few small areas support native hardwoods. This soil is moderately suited to trees. Seedling mortality is a problem. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density.

The land capability classification is IVe.

792D—Armstrong loam, 9 to 14 percent slopes. This strongly sloping, moderately well drained or somewhat poorly drained soil is on short, convex side slopes, narrow, convex ridgetops, and convex nose slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is very dark gray loam about 8 inches thick. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is dark grayish brown, friable loam; the next part is brown, very firm clay; and the lower part is yellowish brown, firm clay loam. In some small areas some of the subsoil is mixed with the surface layer.

Included with this soil in mapping are small areas of Gara, Kniffin, Pershing, and Bucknell soils. Gara soils are on the lower slopes, and Kniffin, Pershing, and

Bucknell soils are on the upper slopes. Gara soils are better drained than the Armstrong soil, Kniffin and Pershing soils contain less sand, and Bucknell soils are more poorly drained. Included soils make up 5 to 15 percent of the unit.

The Armstrong soil is slowly permeable. The available water capacity is high, and runoff is rapid. The soil has a seasonal high water table and has seepy spots during wet periods. The shrink-swell potential is high. The content of organic matter typically is about 2.5 to 3.5 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are used for hay and pasture. Some of the acreage is cultivated. This soil is poorly suited to intensive row cropping. It is best suited to small grain and to grasses and legumes for hay and pasture. If row crops are grown, erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

A few small areas support native hardwoods. This soil is moderately suited to trees. Seedling mortality is a problem. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density.

The land capability classification is IVe.

792D2—Armstrong loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained or somewhat poorly drained soil is on short, convex side slopes, narrow, convex ridgetops, and convex nose slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is very dark grayish brown loam about 7 inches thick. It is mixed with streaks and pockets of brown subsoil material. The subsoil is about 42 inches thick. It is mottled. The upper part is brown, very firm clay, and the lower part is yellowish brown, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled loam. In some small severely eroded areas, the surface layer is mainly dark brown clay loam.

Included with this soil in mapping are small areas of Gara, Kniffin, Pershing, and Bucknell soils. Gara soils are on the lower slopes, and Kniffin, Pershing, and Bucknell soils are on the upper slopes. Gara soils are better drained than the Armstrong soil, Kniffin and Pershing soils contain less sand, and Bucknell soils are more poorly drained. Included soils make up 5 to 15 percent of the unit.

The Armstrong soil is slowly permeable. The available water capacity is high, and runoff is rapid. The soil has a seasonal high water table and has seepy spots during wet periods. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are used for hay and pasture. Some of the acreage is cultivated. This soil is poorly suited to intensive row cropping. It is best suited to small grain and to grasses and legumes for hay and pasture. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, further erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

A few small areas support native hardwoods. This soil is moderately suited to trees. Seedling mortality is a problem. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density.

The land capability classification is IVe.

792D3—Armstrong clay loam, 9 to 14 percent slopes, severely eroded. This strongly sloping, moderately well drained or somewhat poorly drained soil is on short, convex side slopes, narrow, convex ridgetops, and convex nose slopes in the uplands. Areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is dark brown clay loam about 5 inches thick. Generally, plowing has mixed mainly brown subsoil material into the plow layer. The subsoil is about 40 inches thick. It is mottled. The upper part is brown, very firm clay, and the lower part is yellowish brown, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled loam.

Included with this soil in mapping are small areas of Gara, Kniffin, Pershing, and Bucknell soils. Gara soils are on the lower slopes, and Kniffin, Pershing, and Bucknell soils are on the upper slopes. Gara soils are better drained than the Armstrong soil, Kniffin and Pershing soils contain less sand, and Bucknell soils are more poorly drained. Included soils make up 5 to 15 percent of the unit.

The Armstrong soil is slowly permeable. The available water capacity is high, and runoff is rapid. The soil has a seasonal high water table and has seepy spots during wet periods. The shrink-swell potential is high. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are used for hay and pasture. Some of the acreage is cultivated. This soil is unsuited to cultivated crops because of the slope and a severe hazard of further erosion. In areas that are used for hay and pasture, good management is needed because erosion is a severe hazard and reestablishing a plant cover is difficult. Tilling the soil increases the susceptibility to erosion. As a result, the grasses and legumes should be interseeded into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few small areas support native hardwoods. This soil is moderately suited to trees. Seedling mortality is a problem. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density.

The land capability classification is VIe.

795D2—Ashgrove silty clay loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, poorly drained soil is on short, convex side slopes, on convex nose slopes, and in coves at the upper end of drainageways in the uplands. Areas are long and irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown silty clay loam about 4 inches thick. It is mixed with streaks and pockets of dark brown subsoil material. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is dark brown and brown, firm and very firm silty clay, and the lower part is gray, very firm clay. In some small areas the surface layer is mixed yellowish brown and dark brown silty clay.

Included with this soil in mapping are small areas of the moderately well drained Keswick and well drained Lindley soils. These soils are on the lower parts of the side slopes. They contain less clay than the Ashgrove soil. They make up 5 to 15 percent of the unit.

The Ashgrove soil is very slowly permeable. The available water capacity is moderate, and runoff is rapid. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer. The subsoil is very low in content of available phosphorus and low in content of available potassium.

Most areas are used as pasture or woodland. This soil is poorly suited to intensive row cropping. It is better suited to small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, wetness is a serious limitation and erosion is a very severe hazard. Erosion can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

Some areas support native hardwoods. This soil is poorly suited to trees. Logging equipment should be

used only during the drier parts of the year or during winter, when the ground is frozen. Special high flotation equipment can be used for harvesting or woodland management if it is necessary during wet periods. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IVe.

822D2—Lamoni clay loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, somewhat poorly drained soil is on the lower side slopes along drainageways that extend into the uplands. Areas are long and irregularly shaped and range from 10 to 60 acres in size.

Typically, the surface layer is very dark gray clay loam about 8 inches thick. It is mixed with streaks and pockets of dark grayish brown subsoil material. The subsoil is about 44 inches thick. It is mottled. The upper part is dark grayish brown, friable clay loam; the next part is dark grayish brown and yellowish brown, very firm clay; and the lower part is yellowish brown, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown clay loam. In some small areas the surface layer is mainly dark grayish brown and yellowish brown clay.

Included with this soil in mapping are small areas of Clarinda and Shelby soils. The poorly drained Clarinda soils are in the coves of the drainageways, and the well drained Shelby soils are on the lower side slopes. Included soils make up 5 to 15 percent of the unit.

The Lamoni soil is slowly permeable. The available water capacity is high, and runoff is rapid. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and low in content of available potassium.

Most areas are cultivated or are used for pasture and hay. This soil is poorly suited to intensive row cropping. It is best suited to small grain and to grasses and legumes for hay and pasture. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

The land capability classification is IVe.

831B—Pershing silt loam, benches, 2 to 5 percent slopes. This gently sloping, moderately well drained or somewhat poorly drained soil is on convex ridgetops on loess-covered stream benches. Areas are long and narrow or irregularly shaped and range from 5 to 25 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is dark grayish brown silt loam about 3 inches thick. The subsoil extends to a depth of about 60 inches. It is mottled. The upper part is brown, friable silty clay loam; the next part is grayish brown, firm silty clay; and the lower part is light brownish gray, firm and friable silty clay loam.

Included with this soil in mapping are small areas of the poorly drained Belinda soils on the less sloping parts of the landscape. These soils make up about 5 to 10 percent of the unit.

The Pershing soil is slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2.5 to 3.5 percent in the surface layer. The subsoil is medium in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a severe hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed in some areas. Cuts for terraces should not expose the less productive subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility

and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few areas support native hardwoods. This soil is moderately suited to trees. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IIIe.

831C2—Pershing silty clay loam, benches, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained or somewhat poorly drained soil is on convex ridgetops and short, convex side slopes on loess-covered stream benches. Areas are irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown silty clay loam about 7 inches thick. It is mixed with streaks and pockets of brown subsoil material. The subsoil is about 40 inches thick. It is mottled. The upper part is brown, friable silty clay loam, and the lower part is grayish brown and light brownish gray, firm silty clay. The substratum to a depth of about 60 inches is light olive gray, mottled silty clay loam.

Included with this soil in mapping are small areas of Caleb and Mystic soils on the lower parts of the side slopes. Caleb soils contain more sand than the Pershing soil. Mystic soils have a strong brown, clayey subsoil. Included soils make up 5 to 15 percent of the unit.

The Pershing soil is slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is medium in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, further erosion is a severe hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, terraces, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the less productive subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, further erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few areas are used as native woodland. This soil is moderately suited to trees. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IIIe.

832B—Weller silt loam, benches, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on convex ridgetops on loess-covered stream benches. Areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown and dark grayish brown silt loam about 3 inches thick. The subsurface layer is grayish brown and brown silt loam about 11 inches thick. The subsoil extends to a depth of about 60 inches. The upper part is brown and yellowish brown, friable silty clay loam; the next part is yellowish brown and brown, mottled, firm silty clay; and the lower part is grayish brown and yellowish brown, mottled, friable silty clay loam.

Included with this soil in mapping are small areas of the poorly drained Belinda soils on the less sloping parts of the landscape. These soils make up about 5 to 10 percent of the unit.

The Weller soil is slowly permeable. The available

water capacity is high, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is medium in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated or used for hay or pasture. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a severe hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the less productive subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, weed and brush control, adequate livestock watering facilities, applications of fertilizer, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few areas are used as native woodland. This soil is moderately suited to trees. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IIIe.

832C2—Weller silty clay loam, benches, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on convex ridgetops and short, convex side slopes on loess-covered stream benches. Areas are irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown silty clay loam about 6 inches thick. It is mixed with streaks and pockets of yellowish brown subsoil material. The subsoil is about 50 inches thick. It is mottled. The upper part is yellowish brown, friable and firm silty clay loam; the next part is yellowish brown and grayish brown, firm silty clay; and the lower part is grayish brown and yellowish brown, firm silty clay loam. The substratum to a depth of about 60 inches is light brownish gray, mottled silty clay loam.

Included with this soil in mapping are small areas of Douds and Galland soils on the lower parts of the side slopes. Douds soils contain more sand than the Weller soil. Galland soils have a strong brown, clayey subsoil. Included soils make up about 5 to 15 percent of the unit.

The Weller soil is slowly permeable. The available water capacity is high, and runoff is medium. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer. The subsoil is medium in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated or used for pasture and hay. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay or pasture. If cultivated crops are grown, further erosion is a severe hazard. It can be controlled in intensively row cropped areas by a system of conservation tillage that leaves crop residue on the surface, contour farming, terraces, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Cuts for terraces should not expose the less productive subsoil. Seepage can occur in the terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. If the pasture or hayland is tilled, erosion is a severe hazard. It can be controlled by interseeding grasses and legumes into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, adequate livestock watering facilities, weed and brush control, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few areas are used as native woodland. This soil is moderately suited to trees. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IIIe.

993D2—Gara-Armstrong loams, 9 to 14 percent slopes, moderately eroded. These strongly sloping soils are on short, convex side slopes, narrow, convex ridgetops, and convex nose slopes in the uplands. The well drained Gara soil is on the lower parts of the slopes, and the moderately well drained or somewhat poorly drained Armstrong soil is on the upper parts. Areas are long and narrow or irregularly shaped and range from 10 to 80 acres in size. They are about 60 percent Gara soil and 30 percent Armstrong soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Gara soil is very dark grayish brown loam about 7 inches thick. It is mixed with streaks and pockets of brown subsoil material. The subsoil is clay loam about 33 inches thick. The upper part is dark yellowish brown and friable; the next part is dark yellowish brown and firm; and the lower part is yellowish brown, mottled, and firm. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Typically, the surface layer of the Armstrong soil is very dark grayish brown loam about 7 inches thick. It is mixed with streaks and pockets of brown subsoil material. The subsoil is about 42 inches thick. It is mottled. The upper part is brown, very firm clay, and the lower part is yellowish brown, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled loam.

Included with these soils in mapping are small areas of Kniffin and Rinda soils on the upper slopes. Kniffin soils contain less sand than the Armstrong and Gara soils, and Rinda soils contain more clay and are more poorly drained. Included soils make up about 10 percent of the unit.

The Gara soil is moderately slowly permeable, and the Armstrong soil is slowly permeable. The available water capacity is high in both soils, and runoff is rapid. The Armstrong soil has a seasonal high water table. It also has a high shrink-swell potential. The content of organic matter typically is about 2 to 3 percent in the surface layer of both soils. The subsoil is low or very low in content of available phosphorus and very low in content of available potassium.

Most areas are used for hay and pasture. Some of the acreage is cultivated. These soils are poorly suited to intensive row cropping. They are best suited to small grain and to grasses and legumes for hay and pasture. If row crops are grown, further erosion is a severe hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface, contour farming, grassed waterways, and a cropping sequence that includes grasses and legumes. A combination of these measures is needed. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition. If the pasture or hayland is tilled, further erosion is a severe hazard. As a result, the grasses and legumes should be interseeded into the existing sod.

A few small areas are used as native woodland. These soils are moderately suited to trees. Seedling mortality is a problem on the Armstrong soil. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard on the Armstrong soil.

The land capability classification is IVe.

993D3—Gara-Armstrong clay loams, 9 to 14 percent slopes, severely eroded. These strongly sloping soils are on short, convex side slopes, narrow, convex ridgetops, and convex nose slopes in the uplands. The well drained Gara soil is on the lower parts of the slopes, and the moderately well drained or somewhat poorly drained Armstrong soil is on the upper parts. Areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size. They are about 60 percent Gara soil and 30 percent Armstrong soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Gara soil is yellowish brown clay loam about 4 inches thick. Generally, plowing has mixed mainly subsoil material into the plow layer. The subsoil is yellowish brown, firm clay loam about 32 inches thick. It is mottled in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Typically, the surface layer of the Armstrong soil is dark brown clay loam about 5 inches thick. Generally, plowing has mixed mainly brown subsoil material into the plow layer. The subsoil is about 40 inches thick. It is mottled. The upper part is brown, very firm clay, and the

lower part is yellowish brown, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled loam.

Included with these soils in mapping are small areas of Kniffin and Rinda soils on the upper slopes. Kniffin soils contain less sand than the Armstrong and Gara soils, and Rinda soils contain more clay and are more poorly drained. Included soils make up about 10 percent of the unit.

The Gara soil is moderately slowly permeable, and the Armstrong soil is slowly permeable. The available water capacity is high in both soils, and runoff is rapid. The Armstrong soil has a seasonal high water table. It also has a high shrink-swell potential. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer of both soils. The subsoil is low or very low in content of available phosphorus and very low in content of available potassium.

Most areas are used for hay and pasture. Some of the acreage is cultivated. These soils are unsuited to row crops because of the slope and a severe hazard of further erosion. In areas that are used for hay and pasture, good management is needed because erosion is a severe hazard and reestablishing a plant cover is difficult. Tilling the soils increases the susceptibility to erosion. As a result, grasses and legumes should be interseeded into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few small areas are used as native woodland. These soils are moderately suited to trees. Seedling mortality is a problem on the Armstrong soil. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard on the Armstrong soil.

The land capability classification is VIe.

994E2—Douds-Galland loams, 14 to 18 percent slopes, moderately eroded. These moderately steep soils are on the convex side slopes of high stream benches. The moderately well drained Douds soil is on the lower parts of the slopes, and the moderately well drained or somewhat poorly drained Galland soil is on the upper parts. Areas are long and narrow or irregularly shaped and range from 5 to 30 acres in size. They are about 60 percent Douds soil and 40 percent Galland soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Douds soil is dark grayish brown loam about 4 inches thick. It is mixed with some streaks and pockets of brown subsoil material. The subsoil is about 44 inches thick. The upper part is brown, friable loam and sandy clay loam. The lower part is yellowish brown, friable sandy clay loam and clay loam. The substratum to a depth of about 60 inches is stratified light brownish gray, pale brown, and light yellowish brown loam and sandy loam. In some small areas the surface layer is mainly brown clay loam.

Typically, the surface layer of the Galland soil is dark grayish brown loam about 10 inches thick. It is mixed with streaks and pockets of brown clay from the subsoil. The subsoil is about 36 inches thick. It is mottled. The upper part is brown and strong brown, friable and firm clay, and the lower part is brown and yellowish brown, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, strong brown, and gray loam. In some small areas the surface layer is mainly dark grayish brown clay.

The Douds soil is moderately permeable, and the Galland soil is slowly permeable. The available water capacity is moderate in the Douds soil and high in the Galland soil. Runoff is rapid on both soils. The shrink-swell potential is high in the Galland soil. Both soils have a seasonal high water table. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Most areas are used as pasture, hayland, or woodland (fig. 9). These soils are unsuited to row crops because of the slope and a severe hazard of further erosion. In areas that are used for hay and pasture, good management is needed because erosion is a severe hazard and reestablishing a plant cover is difficult. Tilling the soils increases the susceptibility to erosion. As a result, grasses and legumes should be interseeded into the existing sod. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

Many areas support native hardwoods. These soils are moderately suited to trees. Carefully locating skid trails and logging roads reduces the hazard of erosion. Laying out the trails or roads on or nearly on the contour also helps to control erosion. Because of the slope, operating equipment is somewhat hazardous. Special equipment and caution in operating the

Figure 9.—An area of Douds-Galland loams, 14 to 18 percent slopes, moderately eroded. This area is used mainly for hay and pasture. The nearly level bottom land in the background is adjacent to the Des Moines River.

equipment are needed. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

This soil is suited to woodland wildlife habitat. Excluding livestock from wooded areas, constructing water impoundment reservoirs, planting trees and shrubs, and establishing food plots adjacent to the wooded areas help to maintain or improve the habitat.

The land capability classification is VIe.

1130—Belinda silt loam, benches, 0 to 2 percent slopes. This nearly level, poorly drained soil is on narrow or moderately broad divides on loess-covered stream benches. Areas are irregularly shaped and range from 5 to 30 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is dark grayish brown and light brownish gray silt loam about 8 inches thick. The subsoil to a depth of

about 60 inches is grayish brown and mottled. The upper part is friable silty clay loam, the next part is firm silty clay, and the lower part is firm silty clay loam.

Included with this soil in mapping are small areas of the moderately well drained or somewhat poorly drained Pershing soils on the more sloping parts of the landscape. These soils make up 5 to 10 percent of the unit.

The Belinda soil is very slowly permeable. The available water capacity is high, and runoff is very slow. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 2 to 3 percent in the surface layer. The subsoil is medium in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. A surface and subsurface drainage system is needed. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Management can be difficult, however, because this soil is poorly drained and is ponded for brief periods. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few areas support native hardwoods. This soil is moderately suited to trees. Equipment should be used only during the drier parts of the year or during winter, when the ground is frozen. Special high flotation equipment can be used for harvesting or woodland management if it is necessary during wet periods. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IIIw.

1139—Perks Variant sand, 0 to 2 percent slopes. This nearly level, somewhat excessively drained soil is on bottom land. It is subject to flooding. Areas are irregularly shaped and range from 5 to 30 acres in size.

Typically, the surface layer is dark brown sand about 7 inches thick. The substratum is about 19 inches of stratified, multicolored sand and sandy loam. Below this to a depth of about 60 inches is a buried soil. The buried soil is dark grayish brown, mottled silt loam in the upper part and dark gray and dark grayish brown, mottled silty clay loam in the lower part.

Included with this soil in mapping are small areas of the moderately well drained Floris and Nodaway soils. These soils are in scattered areas throughout the map unit. They are not so sandy as the Perks Variant soil. They make up 5 to 15 percent of the unit.

The Perks Variant soil is rapidly permeable in the upper part and moderately permeable in the lower part. The available water capacity is low, and runoff is slow. The soil has a seasonal high water table. The content of organic matter typically is about 0.5 to 1.0 percent in the surface layer. The substratum is very low in content of available phosphorus and potassium.

Most areas are cultivated. Some of the acreage is idle land. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Row crops can be grown in many years if the soil is protected from floodwater. The soil is somewhat droughty. A system of conservation tillage that leaves crop residue on the surface can conserve moisture. Returning crop residue to the soil or regularly adding other organic material improves fertility.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few small areas support native hardwoods. This soil is moderately suited to trees. Seedling mortality is a problem. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density.

The land capability classification is IIIs.

1260—Beckwith silt loam, benches, 0 to 2 percent slopes. This nearly level, poorly drained soil is on narrow or moderately broad divides on loess-covered stream benches. Areas are irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer is grayish brown silt loam about 8 inches thick. The subsoil is about 27 inches thick. It is grayish brown and mottled. The upper part is firm silty clay, and the lower

part is firm silty clay loam. The substratum to a depth of 60 inches is grayish brown silty clay loam.

Included with this soil in mapping are small areas of the moderately well drained Weller soils on the more sloping parts of the landscape. These soils make up 5 to 10 percent of the unit.

The Beckwith soil is very slowly permeable. The available water capacity is high, and runoff is slow or very slow. The soil has a seasonal high water table. The shrink-swell potential is high. The content of organic matter typically is about 1.5 to 2.5 percent in the surface layer. The subsoil is medium in content of available phosphorus and very low in content of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Surface and subsurface drainage systems are needed because wetness and low soil temperature delay spring planting. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Management can be difficult, however, because this soil is poorly drained and is ponded for brief periods. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few areas support native hardwoods. This soil is moderately suited to trees. Equipment should be used only during the drier parts of the year or during winter, when the ground is frozen. Special high flotation equipment can be used for harvesting or woodland management if it is necessary during wet periods. Seedling mortality and windthrow are problems. Planting a large number of seedlings at close intervals helps to compensate for the seedling mortality rate. After the trees are established, thinning may be needed to achieve the desired stand density. Harvest methods that do not leave the remaining trees widely spaced reduce the windthrow hazard.

The land capability classification is IIIw.

1715—Nodaway-Lawson-Ackmore silt loams, 0 to 2 percent slopes. These nearly level soils are on bottom land near intermediately sized streams. They are subject to flooding. The moderately well drained Nodaway soil is commonly next to the present or abandoned stream channels and has received recent deposits of sediment. The somewhat poorly drained Lawson soil and the poorly drained or somewhat poorly drained Ackmore soil are at the lower elevations and are somewhat farther away from the present or abandoned stream channels. Areas are long and narrow or irregularly shaped and range from 10 to more than 100 acres in size. They are about 40 percent Nodaway soil, 25 percent Lawson soil, and 20 percent Ackmore soil. The three soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Nodaway soil is very dark grayish brown silt loam about 8 inches thick. The substratum to a depth of about 60 inches is stratified dark grayish brown, dark brown, grayish brown, and brown silt loam. In some areas the surface layer is loam, silty clay loam, or sandy loam.

Typically, the surface layer of the Lawson soil is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is very dark grayish brown and very dark gray silt loam about 26 inches thick. The substratum to a depth of about 60 inches is very dark grayish brown and dark grayish brown silt loam. In places the surface layer or subsurface layer has thin strata of sandy loam.

Typically, the surface layer of the Ackmore soil is very dark gray silt loam about 9 inches thick. The substratum is about 22 inches of stratified, multicolored, mottled silt loam. Below this to a depth of about 60 inches is a buried layer of black and very dark gray silty clay loam. In places the surface layer and substratum have strata of sandy loam.

Included with these soils in mapping are small areas of the somewhat poorly drained Amana, poorly drained Vesser, and moderately well drained Floris soils. These included soils are in scattered areas throughout the map unit. Amana and Vesser soils are less stratified than the Nodaway and Ackmore soils and are not so dark as the Lawson soil. Floris soils contain more sand in the surface layer than the Nodaway, Lawson, and Ackmore soils. Included soils make up about 15 percent of the unit.

The Nodaway, Lawson, and Ackmore soils are moderately permeable. The available water capacity is very high in the Nodaway and Lawson soils and high in the Ackmore soil. Runoff is slow on all three soils. The shrink-swell potential is high in the Ackmore soil. All three soils have a seasonal high water table. The content of organic matter typically is about 2 to 3 percent in the surface layer of the Nodaway soil, 4 to 6 percent in the surface layer of the Lawson soil, and 1 to

3 percent in the surface layer of the Ackmore soil. The subsoil of the Nodaway soil is medium in content of available phosphorus and potassium. The subsoil of the Lawson and Ackmore soils is low in content of available phosphorus and very low in content of available potassium.

Some areas are used for hay and pasture. Some of the acreage is cultivated. These soils are moderately suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Row crops can be grown in many years if the soils are adequately drained and protected from floodwater. A subsurface drainage system is needed in the lower areas. A ridge-till planting system, in which the soil is ridged and row crops are planted on the ridges, helps to overcome the wetness and low soil temperature in the spring.

Maximum production of grasses and legumes can be achieved if pasture or hayland is well managed. Proper stocking rates, pasture rotation, deferred grazing, applications of fertilizer, weed and brush control, adequate livestock watering facilities, and restricted use during wet periods help to keep the pasture or hayland in good condition.

A few small areas support native hardwoods. These soils are well suited to trees. No major hazards or limitations affect planting if suitable species are selected and the stand is managed properly.

The land capability classification is IIIw.

1977—Richwood Variant loam, 1 to 3 percent slopes. This very gently sloping, well drained soil is on low or very low stream terraces. Areas are irregularly shaped and range from 10 to 30 acres in size.

Typically, the surface layer is very dark grayish brown loam about 9 inches thick. The subsurface layer is dark brown loam about 11 inches thick. The subsoil to a depth of about 60 inches is brown, friable loam. In places the surface layer or subsoil has thin strata of sandy loam.

This soil is moderately permeable. The available water capacity is high, and runoff is slow. The content of organic matter typically is about 3 to 4 percent in the surface layer. The subsoil is very low in content of available phosphorus and potassium.

Almost all areas are cultivated. This soil is well suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a slight hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

The land capability classification is I.

5010—Pits, sand and gravel. This map unit consists of open pits from which sand and gravel have been removed. The pits are 20 to more than 30 feet deep. None of the pits is still in operation. Areas are irregularly shaped and are 2 to 3 acres in size.

The properties of the soil material vary from one area to another. In most areas permeability is moderately rapid to very rapid. The content of organic matter typically is less than 0.5 percent in the surface layer. The soil material is very low in content of available phosphorus and potassium.

Water accumulates in some of the pits. A few inactive pits have been stocked and are used for fishing.

No land capability classification is assigned.

5020—Pits and Dumps. This map unit consists of pits and dumps in areas where coal has been mined. The excavations are open, trench-type pits that are 40 feet or more deep. The dumps are piles of extremely acid spoil material 15 to 30 feet high. The pits and dumps support little or no vegetation. Water accumulates in most of the pits, but it generally has a pH of less than 4, which is too acid for fish. The idle land between or adjacent to the pits and dumps is eventually vegetated by annual weeds, grasses, and trees after mining activity has ceased. Areas are irregularly shaped and commonly range from 5 to more than 50 acres in size.

The soil material and the slope vary considerably from area to area. Generally, permeability is slow or very slow, the available water capacity is moderate or high, and the shrink-swell potential is high. Runoff ranges from medium to very rapid, depending on the slope. The content of organic matter generally is less than 0.5 percent. The soil material commonly has a very low content of available phosphorus and potassium.

No land capability classification is assigned.

5021—Orthents, hilly. These soils are dumps in areas where coal has been mined. The dumps consist of acid spoil material mixed with glacial till, loess, and alluvium. They are 15 to 30 feet high. They are vegetated by annual weeds, grasses, and trees. Areas are irregularly shaped and commonly range from 5 to more than 50 acres in size.

The soil material and the slope vary considerably from area to area. Generally, permeability is slow or very slow, the available water capacity is moderate or

high, and the shrink-swell potential is high. Runoff ranges from medium to very rapid, depending on the slope. The content of organic matter generally is less than 0.5 percent. The soil material commonly has a very low content of available phosphorus and potassium.

No land capability classification is assigned.

5030—Pits, limestone quarries. This map unit consists of open pits from which limestone has been removed. The pits are 20 to 60 feet deep. They are irregularly shaped and commonly are 4 to more than 30 acres in size.

Only one large pit is still mined. The inactive pits generally are on private land. Some are filled with water and stocked with fish.

No land capability classification is assigned.

5040—Orthents, loamy. These gently sloping to moderately steep soils are in areas that have been excavated for soil material to be used in road grades and on other construction sites. About 2 to 20 feet of material has been removed, and the underlying material, generally loam, silt loam, clay loam, and silty clay loam, has been exposed. Areas range from 2 to 20 acres in size. They commonly are square or rectangular, but some are irregularly shaped.

Permeability is moderate or moderately slow. The available water capacity is high, and runoff ranges from rapid to ponded. The shrink-swell potential is moderate or high. The content of organic matter typically is less than 0.5 percent in the surface layer. The soil material is very low in content of available phosphorus and potassium.

Onsite investigation is necessary to determine the suitability of areas of this unit for a specific use.

No land capability classification is assigned.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban and built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

About 93,000 acres in the survey area, or nearly 28 percent of the total acreage, meets the soil requirements for prime farmland. Scattered areas of this land are throughout the county, but most are in the southern part, mainly in associations 1 and 7, which are described under the heading "General Soil Map Units." About 90,000 acres of the prime farmland is used for crops. The crops grown on this land, mainly corn and soybeans, account for an estimated two-thirds of the county's total agricultural income each year.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Some soils that have a seasonal high water table and all soils that are frequently flooded during the growing season qualify for prime farmland only in areas where these limitations have been overcome by drainage measures or flood control. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

According to the 1986 Iowa Agricultural Statistics, about 151,670 acres in Davis County, or 46 percent of the total acreage, is harvested for crops. The main crops are corn and soybeans. Legume-grass mixtures are the major hay crop. The acreage used for row crops has decreased in recent years, whereas the extent of other land uses has remained about the same. Productivity could be increased and soil conservation enhanced by application of crop production technology to all of the cropland in the county. This soil survey, which gives the basic characteristics of each kind of soil, can greatly aid in the application of this technology.

The main management needs on the cropland and pasture in Davis County are measures that help to control erosion, that drain naturally wet soils and seepy areas, and that maintain or improve fertility and tilth.

Water erosion is the major problem on about two-thirds of the cropland and pasture in Davis County. It is a hazard if the slope is more than 2 percent. Loss of the surface layer through erosion reduces the productivity of soils and results in sedimentation in streams. Productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into a plow layer. Loss of the surface layer is especially damaging on soils having a subsoil that is low in fertility, such as Armstrong soils, and on soils having a clayey subsoil, such as Rinda and Clarinda soils. Preparing a good seedbed and tilling are difficult on eroded soils because the original friable surface layer has been removed or thinned and the more strongly structured subsoil

Figure 10.—A water-control structure that protects cropland in the valley of the Fox River from flooding and provides a source of water for the city of Bloomfield.

commonly is hard and cloddy after rains or after it has been tilled when wet. Runoff from eroding soils commonly deposits sediment in streams, drainageways, and road ditches. Control of erosion not only helps to maintain the productivity of soils but also improves the quality of water for municipal use, for recreation, and for fish and wildlife by minimizing the pollution of streams (fig. 10).

Because of a great variety of soils and landscape features, a variety of erosion-control measures is needed in Davis County. The best measures provide a protective cover of plants or crop residue, reduce the runoff rate, and increase the rate of water infiltration. Examples are cover crops, contour stripcropping, contour farming, terraces and diversions, field borders and grassed waterways, and conservation tillage. Generally, a combination of several measures is most effective.

A cropping system that keeps a plant cover on the surface for extended periods can hold soil losses to an amount that will not reduce the productive capacity of the soils. On livestock farms, where part of the acreage is hayland or pasture, forage crops of grasses and legumes not only provide nitrogen and improve tilth for the next cropping season but also provide a protective plant cover.

A conservation tillage system that leaves a protective amount of crop residue on the surface after planting is effective in controlling erosion, especially on the more sloping soils. Examples are no-till, strip-till, and mulch tillage. No-till is a system in which the soil is left undisturbed before planting. Planting is completed in a narrow slot created by the planter or drill. Strip-till also is a system in which the seedbed is prepared and the seed planted in one operation. Tillage is limited to a strip not wider than one-third of the row. Mulch tillage is a system in which the soil is loosened throughout the field and part of the crop residue is incorporated into the soil. Seedbed preparation and planting can be one or more separate operations.

Terraces and diversions control runoff and erosion by reducing the length of slopes. They are most effective on well drained or moderately well drained, gently sloping or moderately sloping soils that have smooth slopes. They are less effective in areas where slopes are irregular or are too steep. Tile-intake terraces help to prevent the accumulation of runoff.

If terraces are constructed on soils that formed in loess, such as Kniffin, Pershing, and Seymour soils, incorporation of the more slowly permeable adjacent soils, such as Armstrong, Clarinda, and Rinda soils, should be avoided or minimized. Because of the high content of clay in the more slowly permeable soils, designing and constructing the terraces and revegetating the terrace slopes are difficult and seepage can be a problem following construction. In areas of Gara soils and other soils having a subsoil that formed partly or entirely in glacial till, the topsoil should be stockpiled when the terraces are constructed and the exposed subsoil should be covered after construction is complete. Diversion terraces commonly are constructed upslope from the Olmitz soils on foot slopes. They help to control the runoff from the adjacent upland slopes.

Contour farming and contour stripcropping are effective in controlling erosion in Davis County. They are most effective on soils that have smooth, uniform slopes, such as Grundy, Kniffin, Pershing, and Seymour soils. Gully-control structures, grassed waterways, and farm ponds help to control erosion in watercourses. The farm ponds also provide water for livestock and for recreation.

Further information about measures that control erosion is available at the local office of the Soil Conservation Service.

Drainage is a major management concern on about 28 percent of the acreage in Davis County. A drainage system typically is needed on the Ackmore, Chequest, Coppock, Humeston, Okaw, Tuskeego, Vesser, and Zook soils on flood plains; on the Beckwith and Belinda soils on benches; and on the Appanoose, Beckwith, Belinda, Haig, and Edina soils on uplands.

Installing a drainage system in poorly drained or very poorly drained soils generally increases productivity and expands the choice of crops that can be grown. The drains should be more closely spaced in the moderately slowly permeable soils than in the more rapidly permeable soils. The slow or very slow permeability in Armstrong, Clarinda, Rinda, and other soils that formed in a paleosol on uplands commonly results in seepy areas within the surrounding soils. Installing lateral interceptor tile drains upslope from the slowly permeable or very slowly permeable soils helps to intercept and drain the excess moisture at the point where loess and glacial till are in contact.

Fertility is affected by the supply of available phosphorus and potassium in the subsoil, by reaction, and by the content of organic matter in the surface layer. The fertility level varies widely in the soils of Davis County. In most of the soils, the supply of available phosphorus and potassium is low or very low and reaction is neutral to strongly acid.

On acid soils applications of ground limestone are needed to promote good plant growth. On all soils the kinds and amounts of lime and fertilizer needed should be determined by the results of soil tests, the needs of the crop, and the expected level of yields. Soil tests generally provide the most beneficial information. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime that should be applied.

Tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils with good tilth generally have a high content of organic matter and are granular and porous. In most of the uneroded upland soils that formed under prairie grasses, the content of organic matter in the surface layer is about 3.0 to 4.5 percent. In the eroded upland soils that formed under prairie grasses, it is less than 1 percent to 3 percent, depending on the degree of erosion that has taken place. It also is less than 1 percent to 3 percent in Armstrong, Gara, Keswick, Lindley, and Shelby soils, which commonly have an accumulation of large stones on the surface. These stones can hinder fieldwork unless they are removed.

Most of the permanent pastures in the county support bluegrass. Some are renovated and support birdsfoot trefoil or crownvetch. Other suitable species that are common in the pastured areas are bromegrass, reed canarygrass, orchardgrass, switchgrass, big bluestem, indiangrass, alfalfa, red clover, and ladino clover. Most

of the bluegrass pastures are not used as cropland because the soils are too steep for cultivation. Measures that prevent overgrazing and thus also prevent surface compaction and gully erosion are needed, especially on steep slopes. Maximum production of grasses and legumes can be achieved if the pasture is properly managed. Applications of fertilizer, weed and brush control, pasture rotation, deferred grazing, proper stocking rates, restricted use during wet periods, and adequate livestock watering facilities help to keep the pasture in good condition.

Erosion is a severe hazard if the plant cover is destroyed when the more sloping pastures are renovated. Interseeding the grasses and legumes into the existing sod eliminates the need for destroying the plant cover during seedbed preparation. If cultivated crops are to be grown before seeding, soil losses can be reduced by conservation tillage, contour farming, and grassed waterways.

Many of the field crops suited to the soils and climate in Davis County are not commonly grown. These include sorghum and milo, used mainly for silage; wheat; barley; various pasture grasses; various native grasses, such as bluestem, switchgrass, and indiangrass, which produce grass seed; sweet corn; nursery stock; early vegetables; and certain orchard crops. The latest information about managing the soils for these crops can be obtained from local offices of the Soil Conservation Service and the Cooperative Extension Service.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other

limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

The original land survey of Iowa, made during the period 1832 to 1859, indicated that about 200,640 acres in Davis County, or 61 percent of the total acreage, was woodland when the first settlers arrived. The early settlers felled a large part of the timber when they cleared the land, mainly for farming. Some of the timber was felled for construction, firewood, and fenceposts. The acreage of woodland in the county declined to an estimated 99,600 acres by 1875 *(3)*. It further declined to about 51,000 acres by 1954 *(5)* and 26,000 acres, or 8 percent of the total land area, by 1974 *(12)*. Most of the timber removed during the last 30 years was taken from moderately steep to steep, highly erodible soils that were converted from woodland to agricultural uses.

The principal species of trees on the upland slopes in Davis County are white oak, northern red oak, black oak, shagbark hickory, bitternut hickory, and white ash. Those on the lowlands and along drainageways include eastern cottonwood, silver maple, green ash, hackberry, basswood, and black walnut. Black cherry, though common, is not plentiful, and river birch is in scattered areas along a number of streams. The number of river birch is declining. American elm and red elm are abundant, but they generally are small because of the effects of Dutch elm disease. Most of the upland timber grows on Lindley, Weller, Rathbun, Keswick, Gara, and Armstrong soils. Most of the bottom land timber is grown in areas of Nodaway-Lawson-Ackmore silt loams, 0 to 2 percent slopes.

Woodland owners tend to cut only the better specimens of desirable species. After this "high-grading," the residual stand is of poorer quality. Scientific management of a stand of trees can result in the production of an increased volume of more valuable wood. Firewood can be cut from the poor-quality stands, thereby improving the composition of the woodland. Good management of the stand can greatly reduce soil losses and improve the habitat for wildlife.

Woodland can produce the best wood crop only if it is well managed. It should be protected from fire and from grazing. The trees with the greatest potential for high-quality wood products should be allowed to grow. The undesirable trees and vines that compete with the best trees for moisture, nutrients, and light should be removed. Before some of the best trees are harvested, their growing space should be occupied by desirable trees. The volume harvested should balance with the growth rate *(25)*. Each stand of trees has its own set of problems that can be analyzed by a professional forester.

Most of the woodland in the county is lightly to heavily pastured. Grazing by livestock results in sparse, poor-quality woodland. If livestock graze in a stand of timber, their hooves damage the base of the larger trees, allowing decay organisms to enter the trees. The hooves of livestock also destroy young trees and compact the soil. Soil compaction increases the runoff rate and decreases the rate of water infiltration, thus denying the trees enough water for rapid growth. The increased runoff carries away valuable topsoil and causes siltation in the adjacent streams *(25)*.

The suitability of soils for trees varies greatly. Green ash, for example, can grow in a poorly drained soil and in a droughty soil on a south-facing slope. Most species cannot grow under such a wide range of soil conditions. Black walnut, for example, has high site requirements. It grows best in a deep, permeable soil on a moist site. Soils on north- and east-facing slopes are better suited to trees than are soils on south- and west-facing slopes. Generally, the deep, well drained or moderately well drained soils with a fair degree of fertility are well suited to trees *(4)*. If the subsoil is slowly permeable, root

development is restricted. As a result, the growth rate also is restricted. Severely eroded soils are better suited to the more primitive tree species, such as eastern white pine and red pine, than to other species.

Further information about woodland management, tree planting, and insect and disease control can be obtained from the Davis County Soil Conservation District, from the Iowa Department of Natural Resources, and from private consulting foresters.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; and *F*, a high content of rock fragments in the soil. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, and F.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, fire lanes, and log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment or season of use is not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged

stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It is the dominant species on the soil and the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, reduce energy requirements, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation (fig. 11). The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soilsi subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils are gently sloping and are not wet or subject to flooding during the period of use (fig. 12). The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The

Figure 11.—Lake Wapello in northwestern Davis County. This lake offers many opportunities for recreational activities, including fishing, boating, and swimming.

surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Davis County supports many kinds of wildlife. The kind and abundance of wildlife in the county have a positive effect on the local economy, mainly because of the opportunities for hunting and fishing. Songbirds and hawks, owls, snakes, and other predators are beneficial because they control rodents and undesirable insects.

The soils in the county indirectly affect the kind and abundance of wildlife through their effect on vegetation

and land use. Topography affects wildlife through its effect on land use. The undisturbed vegetation in moderately steep and steep areas, such as many areas of Lindley soils, is valuable to wildlife. Planting suitable vegetation as needed on the more sloping prairie soils, such as Shelby soils, can improve the habitat for the desirable kinds of wildlife. The nearly level Edina and Appanoose soils generally are cropped intensively. Although they provide only limited shelter and nesting areas for wildlife, they provide corn and small grain for feed. Much of the wildlife in the county inhabits areas of the strongly sloping to steep Gara, Lindley, Shelby, Adair, Keswick, and Armstrong soils on uplands. Because these soils are along the streams throughout the county, the wildlife is well distributed.

Skunk, opossum, raccoon, squirrel, and cottontail rabbit generally are abundant in the uplands. White-tailed deer frequent some areas of the county, especially areas of the Lindley-Keswick-Rathbun, Lindley-Keswick-Weller, and Lindley-Clinton associations, which are described under the heading "General Soil Map Units." Muskrat, mink, and some beaver frequent the creeks throughout the county. They probably are most numerous in areas of the Nodaway-Vesser-Zook association.

Quail and wild turkeys are plentiful throughout the

Figure 12.—A campsite in a wooded area of Keswick soils.

county. The number of pheasants, which were introduced to the county some years ago, is increasing in areas of the Edina-Seymour-Clarinda association. If the habitat is adequate and reproduction is normal, annual hunting does not significantly decrease the number of most game species.

Some marsh areas along creeks provide good habitat for waterfowl, such as ducks and geese. The Zook, Vesser, and Nodaway soils on bottom land provide sites for dikes and impoundments, which improve the habitat for waterfowl. These areas are suitable sites for hunting blinds. The soils also provide food and cover.

Fish, mainly bullhead and carp, are fairly plentiful in the major streams. Many privately owned artificial ponds that range from 0.5 acre to 15 acres in size are well distributed throughout the county. Some well managed ones provide excellent opportunities for bass, bluegill, and catfish fishing. Internal drainage, available water capacity, texture of the subsoil, and permeability are important factors affecting the selection of sites for stocked farm ponds and the development of habitat for waterfowl. Several large water impoundment structures that are part of the Big Wyaconda watershed project provide excellent opportunities for fishing and enhance the habitat for wildlife. Lake Wapello, which is in Lake Wapello State Park, is a 287-acre water impoundment structure that provides good opportunities for tiger muskellunge, bass, and catfish fishing.

Although many areas in the county are suitable as wildlife habitat, many more could be improved or developed. Generally, some soils on each farm can provide good wildlife habitat if they are properly managed. Small, irregularly shaped areas of limited value for other uses can be developed as wildlife habitat. Examples are many areas of the strongly sloping to steep Armstrong, Gara, Keswick, and Lindley soils. Brushy or wooded areas can be fenced so that food and cover are not destroyed by livestock. The borders of fields can be planted to grasses and legumes. These areas should not be clipped, especially during the nesting season for upland birds.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kinds and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, orchardgrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and elderberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian olive, autumn olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage

lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock, the available water capacity in the upper 40 inches, and the content of calcium carbonate affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for

use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, and soil reaction affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. These soils may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is as much as 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, and bedrock.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are naturally fertile or respond well to fertilizer and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel or stones, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large

Figure 13.—A pond reservoir in an area of Gara loam, 14 to 18 percent slopes.

amount of gravel or stones, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment (fig. 13). Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders or organic matter. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 14). "Loam," for example, is soil that is

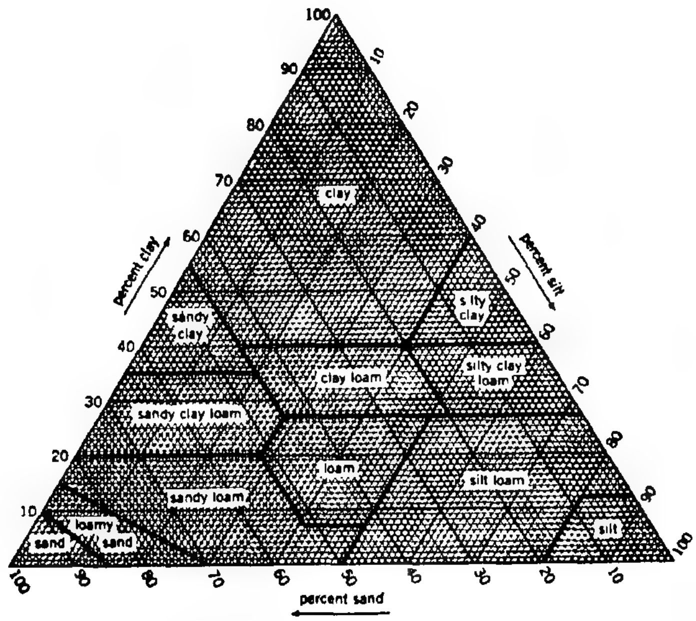

Figure 14.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and

highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at ⅓ bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and

is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained

sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 17, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams and by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs, on the average, once or less in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of

corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(23)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Fluvent (*Fluv*, meaning river, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Udifluvents (*Udi*, meaning moist, plus *fluvent*, the suborder of the Entisols deposited by water).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Udifluvents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is sandy over loamy, mixed, mesic Typic Udifluvents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual (22)*. Many of the technical terms used in the descriptions are defined in *Soil Taxonomy (23)*. Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Ackmore Series

The Ackmore series consists of poorly drained or somewhat poorly drained, moderately permeable soils

on bottom land. These soils formed in silty alluvium. The native vegetation was mixed prairie grasses and deciduous trees. Slopes range from 0 to 2 percent.

Typical pedon of Ackmore silt loam, 0 to 2 percent slopes, 2,170 feet west and 240 feet south of the center of sec. 10, T. 67 N., R. 14 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; few black (10YR 2/1) coatings on faces of peds; weak fine subangular blocky structure parting to weak fine and very fine granular; friable; few fine roots; neutral; abrupt smooth boundary.

C—9 to 31 inches; very dark gray (10YR 3/1) silt loam that has many thin strata of dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), brown (10YR 5/3), and light brownish gray (10YR 6/2) material; common fine prominent strong brown (7.5YR 4/6 and 4/8) mottles; appears massive but has weak bedding planes; friable; few fine roots; neutral; clear smooth boundary.

2Ab1—31 to 39 inches; black (10YR 2/1) silty clay loam; weak fine subangular blocky structure parting to weak fine granular; friable; few fine roots; neutral; clear smooth boundary.

2Ab2—39 to 48 inches; black (10YR 2/1) silty clay loam; few fine prominent strong brown (7.5YR 4/6) mottles; weak fine subangular blocky structure; firm; neutral; gradual smooth boundary.

2Ab3—48 to 60 inches; very dark gray (10YR 3/1) silty clay loam; few fine prominent strong brown (7.5YR 4/6) mottles; weak medium subangular blocky structure; firm; neutral.

Depth to the Ab horizon is 20 to 36 inches. The A horizon is 5 to 10 inches thick. It has chroma of 1 or 2. It is stratified silt loam or silty clay loam. The C horizon has value of 2 to 5 and chroma of 1 or 2. It is stratified silt loam or silty clay loam. The 2Ab horizon has value of 2 or 3. It is silty clay loam or silt loam. The content of clay in this horizon ranges from 26 to 38 percent. Some pedons have value of 4 and chroma of 1 or 2 below a depth of 48 inches.

Adair Series

The Adair series consists of moderately well drained or somewhat poorly drained, slowly permeable soils on short, convex side slopes and convex nose slopes in the uplands. These soils formed in loess or sediments underlain by an exhumed paleosol that weathered from glacial till. The native vegetation was tall prairie grasses. Slopes range from 5 to 14 percent.

The Adair soils in this county are taxadjuncts to the series because they do not have a mollic epipedon.

Typical pedon of Adair clay loam, 5 to 9 percent slopes, moderately eroded, 820 feet west and 1,520 feet south of the center of sec. 17, T. 68 N., R. 13 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) clay loam, dark grayish brown (10YR 4/2) dry; mixed with some streaks and pockets of brown (10YR 4/3) subsurface material; moderate fine and medium granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

BA—7 to 12 inches; brown (7.5YR 4/4) clay loam; mixed with some streaks and pockets of very dark gray (10YR 3/1) material; weak fine subangular blocky structure parting to moderate medium and fine granular; friable; few fine roots; slightly acid; abrupt smooth boundary.

2Bt1—12 to 17 inches; strong brown (7.5YR 5/6) clay; common fine prominent yellowish red (5YR 4/6), few fine prominent dark red (2.5YR 3/6), and few medium prominent grayish brown (10YR 5/2) mottles; moderate fine and very fine subangular blocky structure; very firm; common distinct clay films on faces of peds; few fine roots; few dark concretions of iron and manganese oxide; few small pebbles; medium acid; clear smooth boundary.

2Bt2—17 to 25 inches; strong brown (7.5YR 5/6) clay; common fine prominent yellowish red (5YR 4/6) mottles; moderate fine and medium subangular blocky structure; very firm; common distinct clay films on faces of peds; few fine roots; few fine dark concretions of iron and manganese oxide; few small pebbles; medium acid; clear smooth boundary.

2Bt3—25 to 33 inches; strong brown (7.5YR 5/8) and yellowish brown (10YR 5/6) clay loam; common fine and medium prominent yellowish red (5YR 4/6) mottles; moderate fine and medium subangular blocky structure; firm; common distinct clay films on faces of peds; few fine roots; few fine dark concretions of iron and manganese oxide; few small pebbles; slightly acid; clear smooth boundary.

2Bt4—33 to 45 inches; strong brown (7.5YR 5/8) clay loam; few fine prominent grayish brown (10YR 5/2) mottles; moderate medium and coarse subangular blocky structure; firm; common distinct clay films on faces of peds; few fine roots; few fine dark concretions of iron and manganese oxide; few small pebbles; mildly alkaline; clear smooth boundary.

2Bt5—45 to 54 inches; yellowish brown (10YR 5/6 and 5/8) clay loam; common fine distinct grayish brown (10YR 5/2) mottles; moderate medium and coarse

subangular blocky structure; firm; common distinct clay films on faces of peds; few fine roots; few fine dark concretions of iron and manganese oxide; few small pebbles; mildly alkaline; clear smooth boundary.

2C—54 to 60 inches; yellowish brown (10YR 5/6 and 5/8) clay loam; few fine prominent dark brown (7.5YR 4/4) mottles; massive; firm; few fine dark concretions of iron and manganese oxide; few soft accumulations of calcium carbonate; few small pebbles; strong effervescence; moderately alkaline.

The solum ranges from 40 to 65 inches in thickness. The A horizon has value of 2 or 3 and chroma of 1 or 2. It is clay loam, loam, or silty clay loam. The 2Bt horizon has hue of 2.5YR to 10YR, value of 3 to 5, and chroma of 3 to 6 in the upper part. It has value of 3 to 5 and chroma of 2 to 8 in the lower part. In the upper 20 inches of the 2Bt horizon, the content of clay ranges from 38 to 46 percent.

Amana Series

The Amana series consists of somewhat poorly drained, moderately permeable soils on bottom land. These soils formed in silty alluvium. The native vegetation was mixed prairie grasses and deciduous trees. Slopes range from 0 to 2 percent.

Typical pedon of Amana silt loam, in an area of Nodaway-Amana silt loams, 0 to 2 percent slopes; 2,000 feet south and 600 feet east of the center of sec. 20, T. 70 N., R. 15 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; friable; few fine roots; neutral; abrupt smooth boundary.

A—9 to 16 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; moderate fine and medium subangular blocky structure; friable; few distinct light gray (10YR 7/1 dry) silt coatings on faces of peds; few fine roots; neutral; clear smooth boundary.

Bw1—16 to 24 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine distinct yellowish brown (10YR 5/4) and few fine distinct dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; friable; few distinct light gray (10YR 7/1 dry) silt coatings on faces of peds; few fine roots; neutral; gradual smooth boundary.

Bw2—24 to 34 inches; dark grayish brown (10YR 4/2) silt loam; common fine faint dark brown (10YR 4/3) and common fine distinct dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; friable; common distinct light gray (10YR 7/1 dry) silt coatings on faces of peds; few fine roots; medium acid; gradual smooth boundary.

Bw3—34 to 45 inches; dark grayish brown (10YR 4/2) silt loam; common fine distinct dark yellowish brown (10YR 4/4 and 4/6) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few distinct clay films in the lower part; common distinct light gray (10YR 7/1 dry) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; strongly acid; clear smooth boundary.

Bw4—45 to 53 inches; grayish brown (10YR 5/2) silt loam; common fine and medium distinct dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/6) mottles; weak medium and coarse subangular blocky structure; friable; few distinct clay films; common distinct light gray (10YR 7/1 dry) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; strongly acid; clear smooth boundary.

C—53 to 60 inches; dark grayish brown (10YR 4/2) loam; common fine distinct brown (10YR 5/3) and few fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; massive; friable; few fine dark concretions of iron and manganese oxide; medium acid.

The solum ranges from 30 to 60 inches in thickness. The Ap and A horizons have value of 2 or 3 and chroma of 1 or 2. The Bw horizon has hue of 10YR or 2.5Y and value of 4 or 5. It is silt loam or silty clay loam. The C horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 to 6; and chroma of 1 to 4. It is loam or silt loam.

Appanoose Series

The Appanoose series consists of poorly drained, very slowly permeable soils on narrow or moderately broad divides. These soils formed in loess. The native vegetation was mixed grasses and deciduous trees. Slopes range from 0 to 2 percent.

Typical pedon of Appanoose silt loam, 0 to 2 percent slopes, 2,270 feet south and 250 feet east of the northwest corner of sec. 32, T. 68 N., R. 15 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; friable; slightly acid; clear smooth boundary.

E—8 to 14 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/1) dry; few fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium platy structure; friable; common distinct light gray (10YR 7/1 dry) and white (10YR 8/1 dry) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; strongly acid; abrupt smooth boundary.

Btg1—14 to 18 inches; dark gray (10YR 4/1) and dark grayish brown (2.5Y 4/2) silty clay; common very dark gray (10YR 3/1) coatings on faces of peds; common fine distinct yellowish brown (10YR 5/6), brown (7.5YR 4/4), and strong brown (7.5YR 5/6) mottles; moderate fine angular and subangular blocky structure; very firm; common distinct clay films on faces of peds; few distinct light gray (10YR 7/1 dry) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg2—18 to 24 inches; dark grayish brown (2.5Y 4/2) silty clay; common fine prominent yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; moderate medium prismatic structure parting to moderate fine and medium angular and subangular blocky; very firm; common distinct clay films on faces of peds; few fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg3—24 to 28 inches; dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) silty clay; common fine prominent yellowish brown (10YR 5/6) and brown (7.5YR 4/4) and common fine distinct light olive brown (2.5Y 5/4) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg4—28 to 31 inches; grayish brown (2.5Y 5/2) and dark grayish brown (2.5Y 4/2) silty clay; common fine prominent yellowish brown (10YR 5/6), brown (7.5YR 4/4), and strong brown (7.5YR 5/6) and common fine distinct light olive brown (2.5Y 5/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg5—31 to 36 inches; grayish brown (2.5Y 5/2) silty clay; common fine prominent yellowish brown (10YR 5/6), brown (7.5YR 4/4), and strong brown (7.5YR 5/6) and common fine distinct light olive brown (2.5Y 5/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common distinct clay films on faces of peds; common fine and medium dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

Btg6—36 to 39 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6), brown (7.5YR 4/4), and strong brown (7.5YR 5/6) and common fine distinct light olive brown (2.5Y 5/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

Btg7—39 to 48 inches; grayish brown (2.5Y 5/2) and light brownish gray (2.5Y 6/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6), brown (7.5YR 4/4), and strong brown (7.5YR 5/6) and common fine distinct light olive brown (2.5Y 5/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

BCg—48 to 60 inches; grayish brown (2.5Y 5/2) and light brownish gray (2.5Y 6/2) silty clay loam; common fine and medium distinct light olive brown (2.5Y 5/4) and common fine and medium prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine concretions of iron and manganese oxide; slightly acid.

The solum is 60 inches or more thick. The Ap or A horizon has chroma of 1 or 2. The E horizon has value of 4 or 5 and chroma of 1 or 2. The Btg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 3. In the upper 20 inches of this horizon, the content of clay ranges from 48 to 55 percent.

Armstrong Series

The Armstrong series consists of moderately well

drained or somewhat poorly drained, slowly permeable soils on short, convex side slopes, narrow, convex ridgetops, and convex nose slopes in the uplands. These soils formed in loess or sediments underlain by an exhumed paleosol that weathered from glacial till. The native vegetation was mixed prairie grasses and deciduous trees. Slopes range from 5 to 14 percent.

Typical pedon of Armstrong loam, 5 to 9 percent slopes, 2,080 feet north and 180 feet west of the southeast corner of sec. 17, T. 68 N., R. 15 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; moderate fine and medium granular structure; friable; common light gray (10YR 7/2 dry) very fine sand coatings on faces of peds; slightly acid; clear smooth boundary.

BE—8 to 12 inches; dark grayish brown (10YR 4/2) loam; few very dark grayish brown (10YR 3/2) coatings on faces of peds; moderate fine subangular blocky structure; friable; common distinct light gray (10YR 7/2 dry) very fine sand coatings on faces of peds; stone line at base of horizon; strongly acid; gradual smooth boundary.

2Bt1—12 to 16 inches; brown (7.5YR 4/4) clay; common fine prominent red (2.5YR 4/5) and common fine distinct brown (7.5YR 5/2) mottles; moderate medium subangular blocky structure; very firm; common distinct clay films on faces of peds; about 3 percent small pebbles; strongly acid; gradual smooth boundary.

2Bt2—16 to 24 inches; brown (7.5YR 4/4) clay; common fine prominent red (2.5YR 4/6) and grayish brown (10YR 5/2) and common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; very firm; common distinct clay films on faces of peds; few fine dark concretions of iron and manganese oxide; about 3 percent small pebbles; very strongly acid; gradual smooth boundary.

2Bt3—24 to 31 inches; yellowish brown (10YR 5/6) clay loam; common fine and medium distinct brown (10YR 4/3), strong brown (7.5YR 5/6), and light brownish gray (2.5Y 6/2) mottles; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; few fine dark concretions of iron and manganese oxide; about 3 percent small pebbles; strongly acid; gradual smooth boundary.

2Bt4—31 to 43 inches; yellowish brown (10YR 5/6) clay loam; common fine and medium distinct light brownish gray (2.5Y 6/2) and common fine strong brown (7.5YR 5/6) and brown (10YR 4/3) mottles; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; about 3 percent small pebbles; medium acid; gradual smooth boundary.

2BC—43 to 60 inches; yellowish brown (10YR 5/6) clay loam; many fine and medium distinct light brownish gray (2.5Y 6/2) and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; firm; common fine dark concretions of iron and manganese oxide; about 3 percent small pebbles; slightly acid.

The solum ranges from 42 to 80 inches in thickness. The A or Ap horizon has chroma of 1 or 2. It is loam, clay loam, or silt loam. The E horizon has value of 4 or 5 and chroma of 2 or 3. The 2Bt horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 or 5; and chroma of 3 to 6. The content of clay in this horizon ranges from 36 to 48 percent.

Armstrong clay loam, 5 to 9 percent slopes, severely eroded, Armstrong clay loam, 9 to 14 percent slopes, severely eroded, and the Armstrong soil in the map unit Gara-Armstrong clay loams, 9 to 14 percent slopes, severely eroded, are taxadjuncts because they have a lighter colored surface soil than is definitive for the series.

Ashgrove Series

The Ashgrove series consists of poorly drained, very slowly permeable soils on short, convex side slopes and convex nose slopes and in coves at the upper end of drainageways in the uplands. These soils formed in an exhumed, gray, clayey paleosol that weathered from glacial till. The native vegetation was deciduous trees. Slopes range from 9 to 14 percent.

Typical pedon of Ashgrove silty clay loam, 9 to 14 percent slopes, moderately eroded, 450 feet west and 1,000 feet north of the center of sec. 14, T. 67 N., R. 14 W.

Ap—0 to 4 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; mixed with some streaks and pockets of dark brown (10YR 4/3) subsoil material; many very dark grayish brown (10YR 3/2) coatings on faces of peds; weak fine granular structure; friable; few fine roots; medium acid; abrupt smooth boundary.

BA—4 to 8 inches; dark brown (10YR 4/3) silty clay; mixed with some streaks and pockets of very dark grayish brown (10YR 3/2) material; common fine

distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; firm; few fine roots; medium acid; abrupt smooth boundary.

2Bt—8 to 15 inches; brown (10YR 5/3) silty clay; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; very firm; few distinct clay films on faces of peds; few fine roots; medium acid; gradual smooth boundary.

2Btg1—15 to 30 inches; gray (10YR 5/1) clay; few fine distinct strong brown (7.5YR 5/6) and common fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; very firm; common distinct clay films on faces of peds; few fine roots; few fine dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

2Btg2—30 to 45 inches; gray (10YR 6/1) clay; few fine prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; very firm; common distinct clay films on faces of peds; few fine dark concretions of iron and manganese oxide; few soft accumulations of calcium carbonate; neutral; gradual smooth boundary.

2Btg3—45 to 60 inches; gray (10YR 5/1) clay; common medium distinct strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; very firm; common distinct clay films on faces of peds; few fine dark concretions of iron and manganese oxide; few soft accumulations of calcium carbonate; neutral.

The solum ranges from 42 to 84 inches in thickness. The Ap horizon has chroma of 2 or 3. The 2Btg horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 to 6; and chroma of 1 to 3. In the upper part of this horizon, the content of clay ranges from 45 to 55 percent.

Beckwith Series

The Beckwith series consists of poorly drained, very slowly permeable soils on narrow or moderately broad upland divides and on high stream terraces. These soils formed in loess. The native vegetation was deciduous trees. Slopes range from 0 to 2 percent.

Typical pedon of Beckwith silt loam, 0 to 2 percent slopes, 1,440 feet east and 640 feet south of the center of sec. 7, T. 70 N., R. 15 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; weak thin platy structure parting to moderate fine and very fine granular; friable; many fine roots; slightly acid; abrupt smooth boundary.

E—7 to 15 inches; grayish brown (10YR 5/2) silt loam, white (10YR 8/2) dry; moderate thin platy structure; friable; few fine roots; few dark concretions of iron and manganese oxide; very strongly acid; clear smooth boundary.

EB—15 to 18 inches; grayish brown (10YR 5/2) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; common distinct white (10YR 8/2 dry) silt coatings on faces of peds; few fine roots; few dark concretions of iron and manganese oxide; very strongly acid; abrupt smooth boundary.

Btg1—18 to 26 inches; grayish brown (10YR 5/2) silty clay; few fine distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; strong medium subangular blocky structure; very firm; common distinct clay films on faces of peds; few fine roots; medium acid; clear smooth boundary.

Btg2—26 to 31 inches; grayish brown (10YR 5/2) silty clay; few fine distinct yellowish brown (10YR 5/8) mottles; strong medium subangular blocky structure; very firm; common distinct clay films on faces of peds; few dark concretions of iron and manganese oxide; medium acid; clear smooth boundary.

Btg3—31 to 38 inches; grayish brown (10YR 5/2) silty clay; common fine distinct yellowish brown (10YR 5/8) mottles; weak fine prismatic structure parting to weak medium subangular blocky; very firm; common distinct clay films on faces of peds; common dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg4—38 to 44 inches; grayish brown (2.5Y 5/2) silty clay loam; many fine prominent strong brown (7.5YR 5/6) mottles; weak fine prismatic structure parting to weak medium subangular blocky; firm; common distinct clay films on faces of peds; common dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

BCg—44 to 52 inches; grayish brown (2.5Y 5/2) silty clay loam; many fine prominent strong brown (7.5YR 5/6) mottles; weak fine prismatic structure parting to weak fine and very fine subangular blocky; firm; common distinct clay films on faces of peds; common dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

Cg—52 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium prominent strong brown (7.5YR 5/6 and 5/8) mottles; weak fine prismatic structure

parting to weak fine and very fine subangular blocky; firm; common distinct clay films on faces of peds; common dark concretions of iron and manganese oxide; slightly acid.

The solum ranges from 42 to 72 inches in thickness. The Ap horizon has chroma of 1 or 2. It is 0 to 9 inches thick. The E horizon has value of 5 or 6. The Btg horizon has hue of 10YR or 2.5Y and value of 4 or 5. In the upper 20 inches of this horizon, the content of clay ranges from 42 to 50 percent. The Cg horizon has hue of 2.5Y or 5Y and value of 5 or 6.

Belinda Series

The Belinda series consists of poorly drained, very slowly permeable soils on narrow or moderately broad upland divides and on high stream terraces. These soils formed in loess. The native vegetation was mixed grasses and deciduous trees. Slopes range from 0 to 2 percent.

Typical pedon of Belinda silt loam, 0 to 2 percent slopes, 1,660 feet east and 740 feet north of the southwest corner of sec. 22, T. 70 N., R. 13 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; friable; common fine roots; medium acid; abrupt smooth boundary.

E—9 to 17 inches; grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium platy structure; friable; few distinct light gray (10YR 7/1 dry) silt coatings on some peds; few fine roots; few fine dark concretions of iron and manganese oxide; medium acid; clear smooth boundary.

Btg1—17 to 21 inches; grayish brown (10YR 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; friable; common distinct clay films on faces of peds; few distinct light gray (10YR 7/1 dry) silt coatings in the upper part; few fine roots; few fine dark concretions of iron and manganese oxide; strongly acid; clear smooth boundary.

Btg2—21 to 26 inches; dark grayish brown (10YR 4/2) silty clay; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; few fine roots; few fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

Btg3—26 to 34 inches; grayish brown (10YR 5/2) silty clay; common medium prominent strong brown (7.5YR 5/6) and common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few distinct clay films on faces of peds; few fine roots; few fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg4—34 to 42 inches; grayish brown (2.5Y 5/2) silty clay; common medium prominent strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few distinct clay films on faces of peds; few fine roots; few fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg5—42 to 51 inches; grayish brown (2.5Y 5/2) silty clay; common medium prominent strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; firm; few distinct clay films on faces of peds; few distinct black (5YR 2/1) clay lined or filled worm and root channels; few fine roots; few fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

BCg—51 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium prominent strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) and common medium distinct gray (10YR 5/1) mottles; weak medium subangular blocky structure; firm; few distinct black (5YR 2/1) clay lined or filled worm and root channels; few fine dark concretions of iron and manganese oxide; medium acid.

The solum is 60 or more inches thick. The A horizon has chroma of 1 or 2. It is 7 to 9 inches thick. The E horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. The Bt horizon has hue of 10YR or 2.5Y and value of 4 or 5. In the upper 20 inches of this horizon, the content of clay ranges from 42 to 48 percent.

Bucknell Series

The Bucknell series consists of somewhat poorly drained, slowly permeable soils on short, convex side slopes and in coves at the upper end of drainageways in the uplands. These soils formed in a partly truncated, exhumed, clayey paleosol that weathered from glacial till. The native vegetation was mixed prairie grasses and deciduous trees. Slopes range from 9 to 14 percent.

Typical pedon of Bucknell silty clay loam, 9 to 14 percent slopes, moderately eroded, 210 feet north and 140 feet east of the southwest corner of sec. 16, T. 68 N., R. 15 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; mixed with some streaks and pockets of dark grayish brown (2.5Y 4/2) clay from the subsoil; weak medium granular structure; friable; about 1 percent small pebbles; neutral; abrupt smooth boundary.

BE—8 to 12 inches; dark grayish brown (2.5Y 4/2) clay; common fine prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; moderate very fine and fine subangular blocky structure; very firm; few fine dark concretions of iron and manganese oxide; about 2 percent small pebbles; medium acid; gradual smooth boundary.

Btg1—12 to 18 inches; grayish brown (2.5Y 5/2) clay; common fine and medium prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; very firm; common distinct clay films on faces of peds; few fine dark concretions of iron and manganese oxide; about 3 percent small pebbles; strongly acid; gradual smooth boundary.

Btg2—18 to 26 inches; grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) clay; few fine prominent strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; very firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; about 3 to 4 percent small pebbles; strongly acid; gradual smooth boundary.

Btg3—26 to 39 inches; yellowish brown (10YR 5/6) and gray (10YR 5/1) clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; about 3 to 4 percent small pebbles; medium acid; gradual smooth boundary.

BC—39 to 48 inches; yellowish brown (10YR 5/6) and light olive gray (5Y 6/2) clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; firm; common fine and medium dark concretions of iron and manganese oxide; about 3 to 4 percent small pebbles; medium acid; gradual smooth boundary.

C—48 to 60 inches; yellowish brown (10YR 5/6) and light olive gray (5Y 6/2) clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; massive; firm; common fine and medium dark concretions of iron and manganese oxide; about 3 to 4 percent small pebbles; slightly acid.

The solum ranges from 40 to 60 inches in thickness. The A horizon has value of 2 or 3 and chroma of 1 or 2. The Ap horizon is silty clay loam, clay loam, loam, or silty clay. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 6 in the upper part and hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 to 8 in the lower part. The content of clay ranges from 40 to 50 percent in the upper part of this horizon.

Bucknell silty clay loam, 9 to 14 percent slopes, severely eroded, is a taxadjunct because it has a lighter colored surface soil than is definitive for the series.

Caleb Series

The Caleb series consists of moderately well drained, moderately permeable soils on convex side slopes on high stream terraces along most of the major streams in the county. These soils formed in stratified alluvium. The native vegetation was mixed prairie grasses and deciduous trees. Slopes range from 9 to 18 percent.

Typical pedon of Caleb loam, 9 to 14 percent slopes, moderately eroded, 470 feet west and 75 feet south of the center of sec. 20, T. 68 N., R. 13 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) loam, grayish brown (10YR 5/2) dry; mixed with some streaks and pockets of brown (10YR 4/3) subsoil material; weak fine subangular blocky structure parting to weak fine granular; a few thin plates in the lower part; friable; few fine silt coatings on faces of peds; many fine roots; neutral; abrupt smooth boundary.

BE—8 to 14 inches; brown (10YR 4/3) loam; common very dark grayish brown (10YR 3/2) coatings on faces of peds; weak thick platy structure parting to weak fine and very fine subangular blocky; friable; few distinct silt coatings on faces of peds; few fine roots; slightly acid; clear smooth boundary.

Bt1—14 to 20 inches; brown (10YR 4/3) loam; common dark grayish brown (10YR 4/2) coatings on faces of peds; weak fine subangular blocky structure; friable; few distinct silt coatings on faces of peds; few fine roots; strongly acid; gradual smooth boundary.

Bt2—20 to 30 inches; dark yellowish brown (10YR 4/4) loam; common dark grayish brown (10YR 4/2) coatings on faces of peds; moderate medium subangular blocky structure; friable; common

distinct clay films on faces of peds; few fine roots; medium acid; gradual smooth boundary.

Bw1—30 to 35 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; very friable; few fine roots; medium acid; clear smooth boundary.

Bw2—35 to 42 inches; yellowish brown (10YR 5/4) sandy loam; weak medium subangular blocky structure; very friable; few fine roots; medium acid; clear smooth boundary.

BC—42 to 54 inches; light yellowish brown (10YR 6/4) loamy sand; single grained; loose; medium acid; clear smooth boundary.

C—54 to 60 inches; yellowish brown (10YR 5/6) sandy clay loam; massive; firm; medium acid.

The solum ranges from 42 to more than 72 inches in thickness. The Ap horizon has chroma of 1 or 2. It is silt loam, loam, or clay loam. The Bt horizon has value of 4 or 5 and chroma of 3 to 6. It is clay loam, loam, or sandy clay loam. Strata of sandy loam, loamy sand, or sand are below a depth of 36 inches.

Cantril Series

The Cantril series consists of somewhat poorly drained, moderately permeable soils on slightly concave or plane foot slopes in the uplands. These soils formed in loamy local alluvium derived from glacial till and loess. The native vegetation was mixed prairie grasses and deciduous trees. Slopes range from 2 to 5 percent.

Typical pedon of Cantril loam, 2 to 5 percent slopes, 2,400 feet west and 340 feet north of the center of sec. 8, T. 67 N., R. 14 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) loam, dark grayish brown (10YR 4/2) dry; moderate fine and very fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

E—8 to 18 inches; dark grayish brown (10YR 4/2) loam; very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium and thick platy structure parting to weak very fine subangular blocky; friable; few distinct light brownish gray (10YR 6/2 dry) silt coatings on faces of peds; common fine roots; slightly acid; clear smooth boundary.

EB—18 to 23 inches; dark grayish brown (10YR 4/2) loam; few fine distinct yellowish brown (10YR 5/8) mottles; moderate fine subangular blocky structure; friable; few distinct light brownish gray (10YR 6/2 dry) silt coatings on faces of peds; common fine roots; medium acid; clear smooth boundary.

Bt1—23 to 31 inches; dark grayish brown (10YR 4/2) clay loam; few fine distinct strong brown (7.5YR 5/6 and 4/6) mottles; moderate fine subangular blocky structure; friable; common distinct clay films on faces of peds; few distinct light brownish gray (10YR 6/2 dry) silt coatings on faces of peds; common fine roots; few dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Bt2—31 to 38 inches; dark grayish brown (10YR 4/2) clay loam; common fine distinct dark yellowish brown (10YR 4/6) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; common distinct clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; common fine roots; few dark concretions of iron and manganese oxide; strongly acid; clear smooth boundary.

Bt3—38 to 46 inches; dark grayish brown (10YR 4/2) clay loam; many fine distinct brown (7.5YR 4/4) and strong brown (7.5YR 4/6) mottles; moderate fine prismatic structure parting to moderate medium subangular blocky; firm; common distinct clay films on faces of peds and common distinct very dark gray (10YR 3/1) organic coatings in root channels; few fine roots; few dark concretions of iron and manganese oxide; few soft accumulations of calcium carbonate; medium acid; gradual smooth boundary.

Bt4—46 to 53 inches; dark brown (10YR 4/3) clay loam; many medium distinct dark brown (7.5YR 4/4) and strong brown (7.5YR 4/6) mottles; moderate medium prismatic structure; firm; common distinct clay films on faces of peds and common distinct very dark gray (10YR 3/1) organic coatings in root channels; few fine roots; few dark concretions of iron and manganese oxide; few soft accumulations of calcium carbonate; medium acid; gradual smooth boundary.

C—53 to 60 inches; dark grayish brown (10YR 4/2) clay loam; few fine distinct strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure; firm; common distinct clay films on faces of peds and common distinct very dark gray (10YR 3/1) organic coatings in root channels; few fine roots; few dark concretions of iron and manganese oxide; few soft accumulations of calcium carbonate; medium acid.

The solum ranges from 42 to 60 inches in thickness. The A horizon has chroma of 1 or 2. It is loam or silt

loam. It is 7 to 9 inches thick. The E horizon has value of 4 or 5. The Bt horizon has value of 4 or 5 and chroma of 2 to 4.

Chequest Series

The Chequest series consists of poorly drained, moderately slowly permeable soils on bottom land. These soils formed in alluvium. The native vegetation was tall prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Chequest silty clay loam, 0 to 2 percent slopes, 900 feet west and 1,180 feet south of the northeast corner of sec. 2, T. 67 N., R. 13 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak fine granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

A—8 to 14 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak fine granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

Btg1—14 to 20 inches; dark gray (10YR 4/1) silty clay loam; few very dark gray (10YR 3/1) coatings on faces of peds; few fine distinct dark brown (7.5YR 3/2 and 3/4) mottles; moderate fine subangular blocky structure; firm; few fine roots; slightly acid; clear smooth boundary.

Btg2—20 to 27 inches; dark gray (10YR 4/1) silty clay loam; few fine distinct dark brown (7.5YR 3/2) mottles; moderate fine and medium subangular blocky structure; firm; few distinct silt coatings on faces of peds; few fine roots; medium acid; clear smooth boundary.

Btg3—27 to 36 inches; gray (10YR 5/1) silty clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; few distinct grainy coatings on faces of peds; few fine roots; medium acid; clear smooth boundary.

Btg4—36 to 41 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; few fine roots; medium acid; gradual smooth boundary.

Btg5—41 to 51 inches; dark gray (10YR 4/1) silty clay loam; few fine distinct brown (7.5YR 4/2 and 4/4) and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; firm; common distinct clay films on faces of peds; common distinct dark organic coatings in root channels; few fine roots; medium acid; gradual smooth boundary.

Btg6—51 to 60 inches; dark gray (10YR 4/1) silty clay loam; few fine distinct dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; firm; common distinct clay films; common distinct dark organic coatings in root channels; few fine roots; medium acid.

The solum is more than 40 inches thick. The Ap and A horizons have value of 2 or 3. The Btg horizon has hue of 10YR, 2.5Y, or 5Y and value of 4 or 5. The content of clay in this horizon ranges from 35 to 42 percent.

Clarinda Series

The Clarinda series consists of poorly drained, very slowly permeable soils on short, convex side slopes, on convex nose slopes, and in coves at the upper end of drainageways in the uplands. These soils formed in a thin mantle of loess or silty sediments and in a gray, clayey paleosol weathered from glacial till. The native vegetation was prairie grasses. Slopes range from 5 to 9 percent.

The Clarinda soils in this county are taxadjuncts to the series because they do not have a mollic epipedon.

Typical pedon of Clarinda silty clay loam, 5 to 9 percent slopes, moderately eroded, 1,189 feet east and 1,017 feet north of the southwest corner of sec. 27, T. 69 N., R. 14 W.

Ap—0 to 6 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; mixed with some streaks and pockets of dark gray (5Y 4/1) subsoil material; weak fine subangular blocky structure parting to weak very fine and fine subangular blocky; friable; few fine roots; medium acid; abrupt smooth boundary.

2Btg1—6 to 12 inches; dark gray (5Y 4/1) silty clay; common fine prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; many distinct clay films on faces of peds; few fine roots; strongly acid; gradual smooth boundary.

2Btg2—12 to 17 inches; dark gray (5Y 4/1) silty clay; common fine prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; very firm; many distinct clay films on faces of peds; few fine roots; strongly acid; gradual smooth boundary.

2Btg3—17 to 23 inches; dark gray (5Y 4/1) silty clay; few fine prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; very firm; many distinct clay films on faces of peds; few fine roots; medium acid; clear smooth boundary.

2Btg4—23 to 35 inches; gray (5Y 5/1) silty clay; common fine prominent yellowish brown (10YR 5/4) mottles; weak medium and coarse subangular blocky structure; very firm; many distinct clay films on faces of peds; slightly acid; clear smooth boundary.

2Btg5—35 to 60 inches; gray (5Y 5/1) clay; few fine prominent yellowish brown (10YR 5/4) mottles; weak medium and coarse subangular blocky structure; very firm; many distinct clay films on faces of peds; neutral.

The solum typically is more than 60 inches thick. The A horizon has chroma of 1 or 2. The thickness of the 2B horizon typically is about 5 feet, but it ranges from 3 to more than 10 feet. This horizon is silty clay or clay. The maximum content of clay ranges from 45 to 58 percent. The gleyed part of this horizon has hue of 10YR, 2.5Y, or 5Y and value of 4 or 5.

Clinton Series

The Clinton series consists of moderately well drained, moderately slowly permeable soils on convex ridgetops in the uplands. These soils formed in loess. The native vegetation was deciduous trees. Slopes range from 2 to 14 percent.

Typical pedon of Clinton silt loam, 2 to 5 percent slopes, 1,950 feet east and 1,300 feet south of the northwest corner of sec. 11, T. 70 N., R. 12 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate very fine and fine granular structure; friable; slightly acid; abrupt smooth boundary.

E—7 to 13 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; common fine faint dark yellowish brown (10YR 4/4) mottles; weak medium platy structure parting to weak fine subangular blocky; friable; many distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt1—13 to 16 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; friable; common distinct clay films on faces of peds; common distinct white (10YR 8/2 dry) silt coatings on faces of peds; strongly acid; gradual smooth boundary.

Bt2—16 to 24 inches; dark yellowish brown (10YR 4/4) silty clay loam; strong fine and medium subangular and angular blocky structure; firm; common distinct clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; strongly acid; gradual smooth boundary.

Bt3—24 to 30 inches; brown (10YR 4/3) silty clay loam; strong fine and medium subangular and angular blocky structure; firm; common distinct clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; strongly acid; gradual smooth boundary.

Bt4—30 to 39 inches; brown (10YR 4/3) silty clay loam; moderate medium prismatic structure parting to moderate medium subangular and angular blocky; firm; common distinct clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; strongly acid; gradual smooth boundary.

Bt5—39 to 50 inches; yellowish brown (10YR 5/4) silty clay loam; few fine faint grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular and angular blocky; firm; common distinct clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

BC—50 to 60 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to weak medium subangular and angular blocky; friable; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; common fine dark concretions of iron and manganese oxide; medium acid.

The solum ranges from 42 to more than 72 inches in thickness. The Ap horizon has chroma of 2 or 3. The Bt horizon has value of 4 or 5 and chroma of 3 or 4. The content of clay in the control section is 36 to 42 percent. The BC horizon has chroma of 3 or 4. Some pedons have a C horizon. This horizon is silt loam.

Coppock Series

The Coppock series consists of somewhat poorly drained or poorly drained, moderately permeable soils in the higher areas of bottom land and on foot slopes and alluvial fans. These soils formed in silty alluvium.

The native vegetation was mixed prairie grasses and deciduous trees. Slopes range from 0 to 5 percent.

Typical pedon of Coppock silt loam, 0 to 2 percent slopes, 820 feet south and 260 feet east of the northwest corner of sec. 24, T. 68 N., R. 14 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; few streaks and pockets of dark brown (10YR 3/3) subsurface material; many very dark gray (10YR 3/1) coatings on faces of peds; weak fine and very fine subangular blocky structure parting to moderate medium and fine granular; friable; few fine roots; few fine strong brown (7.5YR 5/6) accumulations of oxide; slightly acid; abrupt smooth boundary.

E1—9 to 15 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure parting to weak fine subangular blocky; friable; few fine roots; few fine strong brown (7.5YR 5/6) accumulations of oxide; strongly acid; clear smooth boundary.

E2—15 to 22 inches; grayish brown (10YR 5/2) silt loam, light brownish gray (10YR 6/2) and light gray (10YR 7/2) dry; many dark grayish brown (10YR 4/2) coatings on faces of peds; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure parting to weak fine subangular blocky; friable; few fine roots; few fine dark concretions of iron and manganese oxide; strongly acid; clear smooth boundary.

EB—22 to 27 inches; grayish brown (10YR 5/2) silt loam; common fine distinct strong brown (7.5YR 4/6) mottles; moderate fine and medium subangular blocky structure; friable; common distinct silt coatings on faces of peds; few fine roots; few fine dark concretions of iron and manganese oxide; strongly acid; abrupt smooth boundary.

Btg1—27 to 37 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine distinct strong brown (7.5YR 4/6) and dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; friable; common distinct clay films on faces of peds; few fine roots; few fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

Btg2—37 to 44 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine distinct strong brown (7.5YR 4/6) mottles; weak fine prismatic structure; friable; common distinct clay films on faces of peds; few fine roots; few fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

Btg3—44 to 60 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine distinct strong brown (7.5YR 4/6) and dark yellowish brown (10YR 4/6) mottles; moderate medium prismatic structure; friable; common distinct clay films on faces of peds; few fine dark concretions of iron and manganese oxide; medium acid.

The solum ranges from 40 to 70 inches in thickness. The A or Ap horizon has chroma of 1 or 2. It is 7 to 9 inches thick. The E horizon has value of 4 to 6 and chroma of 1 or 2. The Btg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2.

Douds Series

The Douds series consists of moderately well drained, moderately permeable soils on convex side slopes on high stream terraces along most of the major streams in the county. These soils formed in stratified alluvium. The native vegetation was deciduous trees. Slopes range from 9 to 18 percent.

Typical pedon of Douds loam, 9 to 14 percent slopes, moderately eroded, 250 feet west and 165 feet north of the southeast corner of sec. 17, T. 67 N., R. 13 W.

Ap—0 to 4 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; mixed with some streaks and pockets of brown (10YR 5/3) subsoil material; weak fine granular structure; friable; many fine roots; strongly acid; abrupt smooth boundary.

BE—4 to 10 inches; brown (10YR 5/3) loam; dark grayish brown (10YR 4/2) coatings on faces of peds; weak fine granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

Bt1—10 to 15 inches; brown (10YR 5/3) sandy clay loam; weak very fine subangular blocky structure parting to moderate fine granular; friable; common distinct clay films on faces of peds; few fine roots; strongly acid; clear smooth boundary.

Bt2—15 to 28 inches; yellowish brown (10YR 5/4) clay loam; moderate very fine subangular blocky structure; friable; common distinct clay films on faces of peds; few fine roots; strongly acid; clear smooth boundary.

Bt3—28 to 35 inches; yellowish brown (10YR 5/6) sandy clay loam; weak very fine subangular blocky structure; friable; few faint clay films on faces of

peds; few fine roots; strongly acid; clear smooth boundary.

Bt4—35 to 42 inches; yellowish brown (10YR 5/4) clay loam; few fine distinct strong brown (7.5YR 5/6) mottles; weak very fine prismatic structure parting to moderate fine and very fine subangular blocky; friable; common distinct clay films on faces of peds; few fine roots; strongly acid; clear smooth boundary.

Bt5—42 to 48 inches; yellowish brown (10YR 5/4 and 5/6) sandy clay loam; few fine distinct grayish brown (10YR 5/2) mottles; weak very fine prismatic structure parting to weak fine and very fine subangular blocky; friable; few faint clay films on faces of peds; few fine roots; strongly acid; clear smooth boundary.

C—48 to 60 inches; stratified light brownish gray (10YR 6/2), pale brown (10YR 6/3), and light yellowish brown (10YR 6/4) loam and sandy loam; common fine distinct brownish yellow (10YR 6/6) mottles; massive; friable; few fine roots; strongly acid.

The solum ranges from 42 to 72 inches in thickness. The thickness of the solum and the depth to stratified material decrease as the slope increases. The Ap horizon has value of 4 or 5 and chroma of 2 or 3. It is loam or silt loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. It is loam, clay loam, or sandy clay loam. Strata of loam, sandy loam, or loamy sand are common in the lower part of the B horizon and in the C horizon. In the upper 20 inches of the argillic horizon, the content of clay ranges from 26 to 32 percent.

Edina Series

The Edina series consists of poorly drained, very slowly permeable soils on upland divides. These soils formed in loess. The native vegetation was prairie grasses. Slopes are 0 to 1 percent.

Typical pedon of Edina silt loam, 0 to 1 percent slopes, 250 feet north and 100 feet east of the southwest corner of sec. 19, T. 68 N., R. 12 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

E—9 to 20 inches; dark gray (10YR 4/1) silt loam, gray (10YR 6/1) dry; common very dark gray (10YR 3/1) coatings on faces of peds in the upper part; weak medium platy structure; friable; common distinct light gray (10YR 7/1 dry) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; medium acid; clear smooth boundary.

Bt—20 to 22 inches; very dark gray (10YR 3/1) silty clay; common fine distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; very firm; common distinct clay films on faces of peds; few fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg1—22 to 26 inches; dark gray (10YR 4/1) silty clay; common fine distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg2—26 to 31 inches; dark gray (10YR 4/1) silty clay; common fine prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; very firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg3—31 to 34 inches; grayish brown (2.5Y 5/2) silty clay; common fine prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; very firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg4—34 to 40 inches; olive gray (5Y 5/2) silty clay; common fine prominent strong brown (7.5YR 5/6), yellowish brown (10YR 5/6), and light olive brown (2.5Y 5/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common distinct clay films on faces of peds; common fine and medium dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

BCg—40 to 49 inches; olive gray (5Y 5/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine and medium dark concretions of iron and manganese oxide; neutral; gradual smooth boundary.

Cg—49 to 60 inches; olive gray (5Y 5/2) silty clay loam;

common fine prominent yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and light olive brown (2.5Y 5/4) mottles; massive; friable; common distinct dark organic coatings in root channels; common fine and medium dark concretions of iron and manganese oxide; neutral.

The solum ranges from 40 to 60 inches in thickness. The Ap or A horizon has value of 2 or 3 and chroma of 1 or 2. The E horizon has value of 4 or 5 and chroma of 1 or 2. The upper part of the Bt horizon has hue of 10YR or 2.5Y and value of 2 or 3. The lower part has hue of 10YR, 2.5Y, or 5Y; value of 3 to 5; and chroma of 1 or 2. The maximum content of clay in the Bt horizon is 50 to 58 percent.

Floris Series

The Floris series consists of moderately well drained, moderately permeable soils on bottom land. These soils formed in stratified, silty and loamy alluvium. The native vegetation was prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Floris silt loam, 0 to 2 percent slopes, 2,100 feet east and 700 feet north of the southwest corner of sec. 2, T. 70 N., R. 14 W.

Ap—0 to 4 inches; dark brown (10YR 4/3) and very dark grayish brown (10YR 3/2) silt loam, light yellowish brown (10YR 6/4) and brown (10YR 5/3) dry; common dark grayish brown (10YR 4/2) coatings on faces of peds; weak fine and medium granular structure; very friable; few fine roots; neutral; abrupt smooth boundary.

C1—4 to 7 inches; stratified dark brown (10YR 3/3) and brown (10YR 4/3) fine sandy loam; massive; very friable; many distinct fine silt coatings on faces of peds; few fine roots; neutral; abrupt smooth boundary.

C2—7 to 16 inches; stratified dark grayish brown (10YR 4/2), dark brown (10YR 3/3), and brown (10YR 4/3) fine sandy loam; few very dark grayish brown (10YR 3/2) coatings on faces of peds; massive; very friable; many distinct fine silt coatings on faces of peds; few fine roots; few fine dark concretions of iron and manganese oxide; neutral; abrupt smooth boundary.

C3—16 to 23 inches; stratified dark brown (10YR 3/3) and brown (10YR 4/3) fine sandy loam; massive; very friable; few fine roots; few fine dark concretions of iron and manganese oxide; neutral; abrupt smooth boundary.

C4—23 to 60 inches; stratified very dark grayish brown (10YR 3/2), dark brown (10YR 3/3), brown (10YR 4/3), pale brown (10YR 6/3), and very pale brown (10YR 7/3) silt loam; a layer of brown (10YR 4/3) loamy sand at a depth of about 41 inches; massive; friable; dark concretions of iron and manganese oxide in a narrow band at a depth of about 24 inches; slightly acid.

The solum ranges from 4 to 9 inches in thickness. The A horizon is silt loam, loam, fine sandy loam, or sandy loam. The C horizon is stratified. It has hue of 7.5YR, 10YR, or 2.5Y; value of 3 to 7; and chroma of 2 to 4. It is fine sandy loam or sandy loam in the upper part and silt loam, loam, or silty clay loam in the lower part. The depth to silt loam, loam, or silty clay loam ranges from 20 to 36 inches.

Galland Series

The Galland series consists of moderately well drained or somewhat poorly drained, slowly permeable soils on convex side slopes on high stream terraces. These soils formed in stratified alluvium. The native vegetation was deciduous trees. Slopes range from 5 to 18 percent.

Typical pedon of Galland loam, 9 to 14 percent slopes, moderately eroded, 1,300 feet west and 150 feet south of the center of sec. 25, T. 70 N., R. 13 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; mixed with some streaks and pockets of brown (7.5YR 4/4) clay subsoil material in the lower part; weak fine and very fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

Bt1—10 to 17 inches; brown (7.5YR 4/4) clay; common fine prominent dark red (2.5YR 3/6) and common fine distinct reddish brown (5YR 4/4) and yellowish red (5YR 4/6) mottles; moderate medium subangular blocky structure; friable; few faint clay films on faces of peds; few fine roots; strongly acid; clear smooth boundary.

Bt2—17 to 23 inches; brown (7.5YR 4/4) clay; common fine distinct grayish brown (10YR 5/2) and reddish brown (5YR 4/4) mottles; strong medium subangular blocky structure; firm; few faint clay films on faces of peds; few fine roots; strongly acid; clear smooth boundary.

Bt3—23 to 32 inches; strong brown (7.5YR 5/6) clay; few fine prominent dark red (2.5YR 3/6) and reddish brown (5YR 4/4) and common fine prominent

grayish brown (10YR 5/2) mottles; strong medium subangular blocky structure; firm; few faint clay films on faces of peds; few fine roots; strongly acid; gradual smooth boundary.

Bt4—32 to 38 inches; brown (7.5YR 5/4) clay loam; common fine prominent dark red (2.5YR 3/6) and grayish brown (10YR 5/2) and common fine distinct reddish brown (5YR 4/4) mottles; moderate medium subangular blocky structure; firm; few faint clay films on faces of peds; medium acid; gradual smooth boundary.

BC—38 to 46 inches; yellowish brown (10YR 5/6) and light gray (10YR 6/1) clay loam; common fine distinct brown (7.5YR 5/4) mottles; weak medium subangular blocky structure; firm; few small pebbles; slightly acid; gradual smooth boundary.

C—46 to 60 inches; yellowish brown (10YR 5/4 and 5/6), gray (10YR 5/1), and strong brown (7.5YR 5/8) loam; massive; firm; few soft accumulations of calcium carbonate; few small pebbles; slightly acid.

The solum ranges from 36 to 72 inches in thickness. The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The Bt horizon has hue of 10YR, 7.5YR, or 5YR; value of 3 to 6; and chroma of 2 to 8. It is clay loam, clay, or silty clay.

Gara Series

The Gara series consists of well drained, moderately slowly permeable soils on convex nose slopes and side slopes in the uplands. These soils formed in glacial till. The native vegetation was mixed prairie grasses and deciduous trees. Slopes range from 9 to 25 percent.

Typical pedon of Gara loam, 14 to 18 percent slopes, moderately eroded, 1,000 feet south and 135 feet west of the center of sec. 26, T. 70 N., R. 13 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; mixed with some streaks and pockets of brown (10YR 4/3) subsoil material; weak fine subangular blocky structure parting to moderate fine and medium granular; friable; common fine roots; few small pebbles; neutral; abrupt smooth boundary.

Bt1—7 to 15 inches; dark yellowish brown (10YR 4/4) clay loam; moderate fine and medium subangular blocky structure; friable; common distinct clay films on faces of peds; few fine roots; few distinct dark organic coatings in root channels; few small pebbles; strongly acid; gradual smooth boundary.

Bt2—15 to 25 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; few fine roots; few distinct dark organic coatings in root channels; few small pebbles; strongly acid; gradual smooth boundary.

Bt3—25 to 40 inches; yellowish brown (10YR 5/6) clay loam; common medium distinct grayish brown (10YR 5/2) mottles; weak fine and medium subangular blocky structure; firm; few faint clay films on faces of peds; few fine roots; few dark concretions of iron and manganese oxide; few small pebbles; strongly acid; gradual smooth boundary.

C1—40 to 51 inches; yellowish brown (10YR 5/6) clay loam; common medium distinct grayish brown (10YR 5/2) mottles; massive; firm; few dark concretions of iron and manganese oxide; few small pebbles; slightly acid; clear smooth boundary.

C2—51 to 60 inches; yellowish brown (10YR 5/6) clay loam; massive; firm; few dark concretions of iron and manganese oxide; few small pebbles; slightly acid.

The solum ranges from 36 to 70 inches in thickness. The A or Ap horizon has chroma of 1 or 2. It is loam, silt loam, or clay loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The content of clay in this horizon ranges from 32 to 35 percent. The C horizon has value of 4 or 5 and chroma of 4 to 6.

Gara clay loam, 14 to 18 percent slopes, severely eroded, Gara clay loam, 18 to 25 percent slopes, severely eroded, and the Gara soil in the map unit Gara-Armstrong clay loams, 9 to 14 percent slopes, severely eroded, are taxadjuncts because they have a lighter colored surface soil than is defined as the range for the series.

Gosport Series

The Gosport series consists of moderately deep, moderately well drained, very slowly permeable soils on convex side slopes in the uplands. These soils formed in a thin mantle of silty material and in the underlying material weathered from acid shale. The native vegetation was deciduous trees. Slopes range from 9 to 40 percent.

Typical pedon of Gosport silt loam, 18 to 40 percent slopes, 1,560 feet north and 1,300 feet east of the southwest corner of sec. 1, T. 70 N., R. 14 W.

A—0 to 3 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) and brown (10YR 5/3) dry; some

pockets of dark yellowish brown (10YR 4/4) material; common dark grayish brown (10YR 4/2) coatings on faces of peds; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

E—3 to 6 inches; dark brown (10YR 4/3) silty clay loam; common yellowish brown (10YR 5/6) mottles; weak thin platy structure parting to weak fine subangular blocky; friable; many fine distinct silt coatings on faces of peds; few fine roots; medium acid; clear smooth boundary.

Bw1—6 to 11 inches; dark brown (10YR 4/3) and brown (10YR 5/3) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; few fine roots; medium acid; gradual smooth boundary.

Bw2—11 to 18 inches; yellowish brown (10YR 5/4) silty clay; common fine faint yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; few fine roots; strongly acid; gradual smooth boundary.

Bw3—18 to 24 inches; yellowish brown (10YR 5/4) silty clay; few fine distinct dark brown (7.5YR 4/4) and common fine faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few distinct clay films on faces of peds; few fine roots; extremely acid; clear smooth boundary.

Cr—24 to 60 inches; stratified dark gray (10YR 4/1), dark yellowish brown (10YR 4/6), yellowish brown (10YR 5/4), and dark brown (7.5YR 4/4) clay shale; moderate thin platy structure; extremely firm; extremely acid.

The thickness of the solum and the depth to bedrock range from 20 to 40 inches. The depth to material weathered from shale typically is less than 15 inches. The Bw horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 to 6; and chroma of 3 or 4. It is silty clay or clay. The content of clay in the 10- to 40-inch control section ranges from 36 to 58 percent. The color of the Cr horizon varies widely.

Grundy Series

The Grundy series consists of somewhat poorly drained, slowly permeable soils on convex ridgetops and the upper side slopes in the uplands. These soils formed in loess. The native vegetation was tall prairie grasses. Slopes range from 2 to 5 percent.

Typical pedon of Grundy silt loam, 2 to 5 percent slopes, 220 feet south and 800 feet west of the northeast corner of sec. 3, T. 70 N., R. 15 W.

Ap—0 to 9 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate fine and medium granular structure; friable; neutral; clear smooth boundary.

A—9 to 12 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; common black (10YR 2/1) coatings on faces of peds; weak very fine subangular blocky structure; friable; slightly acid; gradual smooth boundary.

Bt1—12 to 15 inches; dark grayish brown (10YR 4/2) silty clay loam; common distinct very dark gray (10YR 3/1) coatings on faces of peds; common fine distinct yellowish brown (10YR 5/4) mottles; moderate very fine and fine subangular blocky structure; firm; common distinct clay films on faces of peds; few fine dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

Bt2—15 to 19 inches; dark grayish brown (10YR 4/2) silty clay; common distinct very dark gray (10YR 3/1) coatings on faces of peds; common fine distinct yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate very fine and fine subangular blocky; firm; common distinct clay films on faces of peds; medium acid; gradual smooth boundary.

Btg1—19 to 23 inches; dark grayish brown (2.5YR 4/2) silty clay; common fine and medium distinct yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

Btg2—23 to 31 inches; grayish brown (2.5YR 5/2) silty clay; common fine distinct yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

Btg3—31 to 40 inches; olive gray (5Y 5/2) silty clay loam; common fine prominent light olive brown (2.5YR 5/4), brown (7.5YR 4/4), and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common distinct clay films on faces of

peds; common fine dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

Btg4—40 to 52 inches; olive gray (5Y 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and light olive brown (2.5Y 5/4) mottles; weak medium subangular blocky structure; firm; few faint clay films on faces of peds; common fine dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

Cg—52 to 60 inches; olive gray (5Y 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6), light olive brown (2.5Y 5/4), and strong brown (7.5YR 5/6) mottles; massive; friable; common fine dark concretions of iron and manganese oxide; neutral.

The solum ranges from 40 to 72 inches in thickness. The mollic epipedon is 11 to 18 inches thick. The Ap and A horizons have value of 2 or 3 and chroma of 1 or 2. They are silt loam or silty clay loam. The upper part of the Bt horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 1 to 3. The lower part has hue of 10YR to 5Y, value of 4 or 5, and chroma of 1 or 2. The content of clay in the upper 20 inches of the argillic horizon ranges from 42 to 45 percent. The C horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 or 2.

Haig Series

The Haig series consists of poorly drained, slowly permeable soils on upland divides. These soils formed in loess. The native vegetation was tall prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Haig silt loam, 0 to 2 percent slopes, 200 feet south and 220 feet east of the northwest corner of sec. 2, T. 70 N., R. 15 W.

Ap—0 to 10 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate fine and medium granular structure; friable; neutral; clear smooth boundary.

A—10 to 15 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; moderate very fine and fine subangular blocky structure; friable; medium acid; gradual smooth boundary.

AB—15 to 18 inches; very dark gray (10YR 3/1) silty clay, gray (10YR 5/1) dry; common distinct black (10YR 2/1) coatings on faces of peds; few fine distinct yellowish brown (10YR 5/6) mottles; moderate very fine and fine subangular blocky structure; firm; few fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg1—18 to 22 inches; dark gray (10YR 4/1) silty clay; common fine distinct yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; common distinct clay films on faces of peds; few fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg2—22 to 26 inches; dark gray (5Y 4/1) silty clay; common fine prominent yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg3—26 to 30 inches; dark gray (5Y 4/1) silty clay; common fine prominent light olive brown (2.5Y 5/4), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; common distinct clay films on faces of peds; common fine concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg4—30 to 34 inches; olive gray (5Y 5/2) silty clay; common fine distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common distinct clay films on faces of peds and in root channels; common fine and medium dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg5—34 to 41 inches; light olive gray (5Y 6/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common distinct clay films on faces of peds and in root channels; common fine and medium dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

Btg6—41 to 50 inches; light olive gray (5Y 6/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and light olive brown (2.5Y 5/4) mottles; weak medium

subangular blocky structure; friable; common distinct clay films on faces of peds and in root channels; common fine and medium dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

BCg—50 to 60 inches; light olive gray (5Y 6/2) silty clay loam; common fine prominent light olive brown (2.5Y 5/4), strong brown (7.5YR 5/6), and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine and medium dark concretions of iron and manganese oxide; slightly acid.

The solum ranges from 48 to 72 inches in thickness. The mollic epipedon is 16 to 24 inches thick. The Ap and A horizons have value of 2 or 3. They are silt loam or silty clay loam. The Btg horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 or 2. The content of clay in the upper 20 inches of the argillic horizon ranges from 42 to 48 percent.

Humeston Series

The Humeston series consists of poorly drained, very slowly permeable soils on bottom land. These soils formed in alluvium. The native vegetation was swamp grasses, sedges, and prairie grasses tolerant of wetness. Slopes range from 0 to 2 percent.

Typical pedon of Humeston silt loam, 0 to 2 percent slopes, 660 feet south and 140 feet east of the center of sec. 31, T. 69 N., R. 12 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine and very fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

A—7 to 13 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; friable; few fine roots; medium acid; clear smooth boundary.

E1—13 to 21 inches; dark gray (10YR 4/1) silt loam; very dark gray (10YR 3/1) coatings on faces of peds in the upper part; few fine distinct yellowish brown (10YR 5/6) mottles; weak thin and medium platy structure; friable; few distinct light gray (10YR 7/1 dry) silt coatings on faces of peds; few fine roots; strongly acid; clear smooth boundary.

E2—21 to 26 inches; dark gray (10YR 4/1) silt loam; few very dark gray (10YR 3/1) coatings in root channels; common fine prominent yellowish brown (10YR 5/6) mottles; weak thin and medium platy structure parting to weak medium subangular blocky; friable; few distinct light gray (10YR 7/1 dry) silt coatings on faces of peds; few fine roots; strongly acid; clear smooth boundary.

BE—26 to 29 inches; dark gray (10YR 4/1) silty clay loam; moderate medium subangular blocky structure; firm; few distinct clay films on faces of peds; few distinct light gray (10YR 7/1 dry) silt coatings on faces of peds; few fine roots; medium acid; clear smooth boundary.

Bt1—29 to 34 inches; very dark gray (10YR 3/1) silty clay; common fine distinct strong brown (7.5YR 4/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common distinct clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—34 to 50 inches; very dark gray (10YR 3/1) silty clay; few fine distinct dark yellowish brown (10YR 4/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common distinct clay films on faces of peds; slightly acid; gradual smooth boundary.

Btg—50 to 60 inches; dark gray (10YR 4/1) silty clay; few fine distinct dark yellowish brown (10YR 4/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common distinct clay films on faces of peds; neutral.

The solum ranges from 48 to 72 inches in thickness. The Ap and A horizons have value of 2 or 3. Depth to the E horizon is 10 to 16 inches. The E horizon has value of 4 or 5. The Bt horizon has value of 2 to 4 and chroma of 1 or less. It is silty clay or silty clay loam.

Keswick Series

The Keswick series consists of moderately well drained, slowly permeable soils on short, convex side slopes and convex nose slopes in the uplands. These soils formed in loess or sediments underlain by an exhumed paleosol that weathered from glacial till. The native vegetation was deciduous trees. Slopes range from 5 to 18 percent.

Typical pedon of Keswick loam, 9 to 14 percent slopes, 2,240 feet south and 200 feet east of the northwest corner of sec. 17, T. 70 N., R. 15 W.

A—0 to 3 inches; very dark gray (10YR 3/1) loam, gray (10YR 6/1) dry; weak fine granular and very thin platy structure; friable; few fine soft dark brown and black accumulations of oxide; medium acid; clear smooth boundary.

E1—3 to 7 inches; grayish brown (10YR 5/2) loam that

has some dark grayish brown (10YR 4/2) material; light gray (10YR 7/1) dry; weak thin platy and fine granular structure; friable; few fine soft dark brown and black accumulations of oxide; strongly acid; clear smooth boundary.

E2—7 to 11 inches; brown (10YR 5/3) loam, light brownish gray (10YR 6/2) dry; common fine prominent reddish brown (5YR 4/4) mottles; weak fine subangular blocky structure; friable; common distinct light gray (10YR 7/2 dry) silt and very fine sand coatings on faces of peds; strongly acid; clear smooth boundary.

2Bt1—11 to 18 inches; reddish brown (5YR 4/4) and brown (7.5YR 5/2) clay loam; few fine distinct red (2.5YR 4/6) mottles; moderate fine and very fine subangular blocky structure; firm; few distinct clay films on faces of peds; common distinct gray (10YR 6/1 dry) silt and very fine sand coatings on faces of peds; weak stone line at top of horizon; strongly acid; clear smooth boundary.

2Bt2—18 to 23 inches; yellowish red (5YR 4/6) and brown (7.5YR 5/3) clay; common fine distinct red (2.5YR 4/6) and grayish brown (2.5Y 5/2) mottles; moderate very fine subangular blocky structure; very firm; common distinct clay films on faces of most peds; strongly acid; clear smooth boundary.

2Bt3—23 to 32 inches; brown (10YR 5/3) and yellowish red (5YR 4/6) clay; moderate fine subangular blocky structure; very firm; common distinct clay films on faces of most peds and in pores; medium acid; gradual smooth boundary.

2Bt4—32 to 43 inches; strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) clay loam; few fine distinct red (2.5YR 4/6) and grayish brown (10YR 5/2) mottles; moderate fine prismatic structure parting to weak medium subangular blocky; firm; few distinct clay films on faces of peds and in root channels; common distinct gray (10YR 5/1) silt and very fine sand coatings on faces of prisms; medium acid; gradual smooth boundary.

2BC—43 to 60 inches; yellowish brown (10YR 5/6) clay loam; brown (10YR 5/3) faces of peds; many distinct gray (5Y 5/1) mottles; weak medium prismatic structure parting to weak medium subangular and angular blocky; firm; few distinct dark brown (7.5YR 4/2) clay flows in some channels; common distinct black stains on faces of prisms; common fine soft black accumulations of oxide; medium acid.

The solum ranges from 42 to 72 inches in thickness. The A horizon has value of 3 or 4 and chroma of 1 or 2. It is silt loam, loam, or clay loam. The E horizon has value of 4 or 5 and chroma of 2 or 3. The 2Bt horizon is clay loam or clay in which the content of clay is 35 to 48 percent. The upper part of this horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 1 to 6. The lower part of the 2Bt horizon and the 2BC horizon have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6.

Kniffin Series

The Kniffin series consists of somewhat poorly drained, very slowly permeable soils on convex side slopes and convex ridgetops in the uplands. These soils formed in loess. The native vegetation was mixed prairie grasses and deciduous trees. Slopes range from 2 to 9 percent.

Typical pedon of Kniffin silt loam, 2 to 5 percent slopes, 2,370 feet south and 400 feet east of the northwest corner of sec. 32, T. 68 N., R. 15 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine and medium granular structure; friable; neutral; clear smooth boundary.

E—8 to 11 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; common very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) coatings on faces of peds; weak medium platy structure parting to moderate very fine subangular blocky; friable; few distinct light gray (10YR 7/1 dry) silt coatings on faces of peds; slightly acid; gradual smooth boundary.

Bt1—11 to 14 inches; dark grayish brown (10YR 4/2) silty clay; many fine distinct strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) mottles; moderate very fine and fine subangular blocky structure; firm; common distinct clay films on faces of peds; few distinct light gray (10YR 7/1 dry) silt coatings on faces of peds; common fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Bt2—14 to 18 inches; dark grayish brown (10YR 4/2) silty clay; many fine distinct strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate fine subangular blocky; very firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

Btg1—18 to 22 inches; dark grayish brown (2.5Y 4/2)

silty clay; many fine distinct yellowish brown (10YR 5/6), dark yellowish brown (10YR 4/4), and strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; very firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

Btg2—22 to 26 inches; grayish brown (2.5Y 5/2) silty clay; common fine distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; very firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg3—26 to 32 inches; olive gray (5Y 5/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6), yellowish brown (10YR 5/6), and light olive brown (2.5Y 5/4) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; common distinct clay films on faces of peds; common fine and medium dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg4—32 to 38 inches; olive gray (5Y 5/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6) and brown (7.5YR 4/4) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; common distinct clay films on faces of peds; common fine and medium dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

Btg5—38 to 48 inches; light olive gray (5Y 6/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6) and brown (7.5YR 4/4) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm; few distinct clay films on faces of peds; common fine and medium dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

BCg—48 to 60 inches; light olive gray (5Y 6/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6) and brown (7.5YR 4/4) mottles; weak coarse prismatic structure; friable; common fine and medium dark concretions of iron and manganese oxide; slightly acid.

The solum typically is more than 60 inches thick. The Ap or A horizon has chroma of 1 or 2, and the E horizon has value of 4 or 5. These horizons are silt loam or silty clay loam. The upper part of the Bt horizon has hue of 10YR or 2.5Y and value of 4 or 5. The lower part has hue of 5Y or 2.5Y and value of 5 or 6. The maximum content of clay in the Bt horizon is 48 to 56 percent.

Lamoni Series

The Lamoni series consists of somewhat poorly drained, slowly permeable or very slowly permeable soils on short, convex side slopes in the uplands. These soils formed in a paleosol weathered from glacial till. The native vegetation was tall prairie grasses. Slopes range from 9 to 14 percent.

The Lamoni soils in this county are taxadjuncts to the series because they do not have a mollic epipedon.

Typical pedon of Lamoni clay loam, 9 to 14 percent slopes, moderately eroded, 920 feet east and 320 feet south of the center of sec. 17, T. 68 N., R. 13 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) clay loam, grayish brown (10YR 5/2) dry; mixed with some streaks and pockets of dark grayish brown (10YR 4/2) subsoil material; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

BA—8 to 15 inches; dark grayish brown (10YR 4/2) clay loam; many very dark gray (10YR 3/1) coatings on faces of peds; few fine prominent yellowish red (5YR 4/6) and common fine distinct yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure parting to weak fine granular; friable; few fine roots; neutral; clear smooth boundary.

2Bt1—15 to 24 inches; dark grayish brown (10YR 4/2) clay; many fine prominent strong brown (7.5YR 5/8) mottles; moderate fine and medium subangular blocky structure; very firm; common distinct clay films on faces of peds; few fine roots; few fine dark concretions of iron and manganese oxide; strongly acid; clear smooth boundary.

2Bt2—24 to 33 inches; yellowish brown (10YR 5/6) clay; common fine distinct yellowish brown (10YR 5/8) and few fine distinct strong brown (7.5YR 5/8) mottles; moderate fine and medium subangular blocky structure; very firm; common distinct clay films on faces of peds; few fine roots; common fine dark concretions of iron and manganese oxide; few small pebbles; neutral; gradual smooth boundary.

2BC—33 to 52 inches; yellowish brown (10YR 5/4) clay loam; common fine distinct yellowish brown (10YR 5/8), brown (10YR 5/3), and strong brown (7.5YR 5/8) mottles; weak medium and coarse subangular blocky structure; firm; few distinct clay films on

faces of peds; few fine roots in the upper part; many fine dark concretions of iron and manganese oxide; few small pebbles; neutral; gradual smooth boundary.

2C—52 to 60 inches; yellowish brown (10YR 5/4) clay loam; common fine prominent strong brown (7.5YR 5/8) and common fine distinct yellowish brown (10YR 5/8) and brown (10YR 5/3) mottles; massive; firm; many fine dark concretions of iron and manganese oxide; few small pebbles; mildly alkaline.

The solum ranges from 48 to 72 inches in thickness. The A horizon has chroma of 1 or 2. It typically is clay loam, but the range includes loam and silty clay loam. The upper part of the 2Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. The lower part has hue of 10YR to 5Y, value of 5 or 6, and chroma of 1 to 6.

Lawson Series

The Lawson series consists of somewhat poorly drained, moderately permeable soils on bottom land. These soils formed in silty alluvium. The native vegetation was tall prairie grasses. Slopes range from 0 to 2 percent.

Typical pedon of Lawson silt loam, 0 to 2 percent slopes, 1,000 feet south and 135 feet east of the northwest corner of sec. 15, T. 68 N., R. 14 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; some very dark gray (10YR 3/1) coatings on faces of peds; weak fine granular structure; friable; few fine roots; neutral; clear smooth boundary.

A1—9 to 29 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; many very dark gray (10YR 3/1) coatings on faces of peds; weak fine subangular blocky structure parting to weak fine granular; friable; few fine roots; neutral; clear smooth boundary.

A2—29 to 35 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak fine and medium subangular blocky structure; friable; few fine roots; neutral; clear smooth boundary.

C1—35 to 42 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; massive; friable; few fine roots; neutral; clear smooth boundary.

C2—42 to 60 inches; dark grayish brown (10YR 4/2) silt loam; massive; friable; few fine roots; few fine dark concretions of iron and manganese oxide; neutral.

The thickness of the solum ranges from 24 to 36 inches. The A horizon has chroma of 1 or 2. The C horizon has value of 3 to 6 and chroma of 1 to 3. The content of clay in the control section ranges from 18 to 30 percent. Strata containing more sand are common below a depth of 40 inches.

Lindley Series

The Lindley series consists of well drained, moderately slowly permeable soils on convex nose slopes and side slopes in the uplands. These soils formed in glacial till. The native vegetation was deciduous trees. Slopes range from 9 to 40 percent.

Typical pedon of Lindley loam, 18 to 40 percent slopes, 80 feet south and 860 feet west of the northeast corner of sec. 22, T. 70 N., R. 15 W.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; slightly acid; clear smooth boundary.

E—3 to 8 inches; brown (10YR 5/3) and yellowish brown (10YR 5/4) loam, very pale brown (10YR 7/3) dry; moderate medium platy structure parting to weak fine subangular blocky; friable; common distinct very fine light gray (10YR 7/2 dry) sand coatings on faces of peds; about 2 percent small pebbles; strongly acid; gradual smooth boundary.

Bt1—8 to 13 inches; yellowish brown (10YR 5/4) clay loam; moderate very fine and fine subangular blocky structure; friable; few distinct clay films on faces of peds; common distinct very fine light gray (10YR 7/2 dry) silt coatings on faces of peds; about 2 percent small pebbles; strongly acid; gradual smooth boundary.

Bt2—13 to 20 inches; yellowish brown (10YR 5/6) clay loam; moderate fine subangular blocky structure; firm; common distinct clay films on faces of peds; few very fine light gray (10YR 7/2 dry) silt coatings on faces of peds; about 3 percent small pebbles; strongly acid; gradual smooth boundary.

Bt3—20 to 26 inches; yellowish brown (10YR 5/6) clay loam; few fine distinct grayish brown (10YR 5/2) mottles; moderate fine and medium subangular blocky structure; firm; common distinct clay films on faces of peds; few distinct very fine light gray (10YR

7/2 dry) silt coatings on faces of peds; about 3 percent small pebbles; strongly acid; gradual smooth boundary.

Bt4—26 to 35 inches; yellowish brown (10YR 5/6) clay loam; few fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; few distinct very fine light gray (10YR 7/2 dry) silt coatings on faces of peds; about 5 percent small pebbles; very strongly acid; gradual smooth boundary.

BC—35 to 44 inches; yellowish brown (10YR 5/4) clay loam; common fine distinct gray (10YR 5/1) mottles; weak medium subangular blocky structure; firm; few distinct clay films on faces of peds; few fine dark concretions of iron and manganese oxide; about 5 percent small pebbles; slightly acid; gradual smooth boundary.

C—44 to 60 inches; yellowish brown (10YR 5/4) clay loam; common fine and medium distinct gray (10YR 5/1) mottles; massive; firm; common fine dark concretions of iron and manganese oxide; about 5 percent small pebbles; common soft accumulations of calcium carbonate; strong effervescence; mildly alkaline.

The solum ranges from 30 to 50 inches in thickness. The A horizon has value of 3 or 4 and chroma of 1 or 2. It typically is loam but in some pedons is silt loam or clay loam. The E horizon has value of 4 or 5 and chroma of 2 to 4. The Bt and C horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The content of clay in the Bt horizon ranges from 30 to 35 percent.

Lineville Series

The Lineville series consists of moderately well drained or somewhat poorly drained, slowly permeable soils on short, convex side slopes and nose slopes in the uplands. These soils formed in a thin layer of loess and in the underlying loamy sediments and weathered glacial till. The native vegetation was mixed prairie grasses and deciduous trees. Slopes range from 5 to 9 percent.

Typical pedon of Lineville silt loam, 5 to 9 percent slopes, moderately eroded, 2,175 feet west and 55 feet south of the center of sec. 35, T. 68 N., R. 14 W.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; mixed with some streaks and pockets of brown (10YR 4/3) subsurface material; weak fine subangular blocky structure parting to weak fine granular; friable; many fine roots; neutral; abrupt smooth boundary.

EB—6 to 10 inches; brown (10YR 4/3) silt loam; few distinct very dark grayish brown (10YR 3/2) coatings on faces of peds; weak thin platy structure parting to weak fine subangular blocky; friable; distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; many fine roots; medium acid; clear smooth boundary.

Bt1—10 to 17 inches; brown (10YR 5/3) silty clay loam; few fine faint grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; many fine roots; medium acid; gradual smooth boundary.

2Bt2—17 to 24 inches; brown (10YR 4/3) clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common distinct clay films on faces of peds; many fine roots; medium acid; gradual smooth boundary.

2Bt3—24 to 33 inches; yellowish brown (10YR 5/4) loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common distinct clay films on faces of peds; few fine roots; few dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

2Bt4—33 to 45 inches; grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common distinct clay films on faces of peds; few fine roots; common dark concretions of iron and manganese oxide; slightly acid; clear smooth boundary.

3Bt5—45 to 51 inches; strong brown (7.5YR 5/6) clay loam; few fine prominent reddish brown (5YR 4/4) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; common dark concretions of iron and manganese oxide; few small pebbles; slightly acid; gradual smooth boundary.

3Bt6—51 to 60 inches; yellowish brown (10YR 5/6) clay loam; many distinct brown (10YR 5/2) coatings on faces of peds and in root channels; many fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; many dark concretions of iron and manganese oxide; few small pebbles; neutral.

The solum ranges from 44 to 80 inches in thickness. The A or Ap horizon has value of 2 or 3 and chroma of 1 or 2. The Bt horizon has value of 4 or 5 and chroma of 2 or 3. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 6. The content of clay in this horizon ranges from 20 to 35 percent. The 3Bt horizon has hue of 5YR, 7.5YR, or 10YR; value of 4 or 5; and chroma of 2 to 6. The content of clay ranges from 35 to 45 percent in the upper part of this horizon.

Mystic Series

The Mystic series consists of moderately well drained or somewhat poorly drained, slowly permeable soils on convex side slopes on high stream terraces. These soils formed in stratified alluvium. The native vegetation was mixed prairie grasses and deciduous trees. Slopes range from 5 to 18 percent.

Typical pedon of Mystic silt loam, 9 to 14 percent slopes, moderately eroded, 1,770 feet north and 1,590 feet east of the southwest corner of sec. 26, T. 70 N., R. 15 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; some yellowish brown (10YR 5/4) silt loam from the subsurface layer; moderate fine and medium granular structure; friable; neutral; abrupt smooth boundary.

E—8 to 12 inches; yellowish brown (10YR 5/4) silt loam, light yellowish brown (10YR 6/4) dry; few very dark grayish brown (10YR 3/2) coatings on faces of peds; weak medium platy structure parting to weak fine subangular blocky; friable; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; strongly acid; gradual smooth boundary.

BE—12 to 16 inches; dark brown (7.5YR 4/4) clay loam; common fine distinct yellowish red (5YR 4/6), grayish brown (10YR 5/2), and yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; friable; common distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; strongly acid; gradual smooth boundary.

Bt1—16 to 22 inches; dark brown (7.5YR 4/4) clay; common fine and medium distinct grayish brown (10YR 5/2), yellowish red (5YR 4/6), and brown (10YR 5/3) mottles; moderate fine subangular blocky structure; firm; common distinct clay films on faces of peds; few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

Bt2—22 to 30 inches; brown (7.5YR 5/2) clay; common fine distinct yellowish red (5YR 4/6) and dark brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; few faint clay films on faces of peds; common fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

Bt3—30 to 39 inches; brown (7.5YR 5/2) clay; common fine distinct dark brown (7.5YR 4/4), yellowish red (5YR 4/6), and brown (10YR 5/3) mottles; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

Bt4—39 to 50 inches; yellowish brown (10YR 5/6) sandy clay loam; common fine distinct light brownish gray (2.5Y 6/2), brown (7.5YR 4/4), and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

BC—50 to 60 inches; yellowish brown (10YR 5/6) sandy loam; common fine distinct light brownish gray (2.5Y 6/2), brown (7.5YR 4/4), and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine dark concretions of iron and manganese oxide; medium acid.

The solum ranges from 48 to 72 inches in thickness. The A horizon has chroma of 1 or 2. It is silt loam, loam, or clay loam. The Bt horizon generally has hue of 2.5YR to 2.5Y, value of 3 to 5, and chroma of 2 to 4. In part of this horizon, the matrix or many mottles have hue of 7.5YR to 2.5YR. The Bt horizon is clay loam, clay, silty clay, or sandy clay loam. The BC horizon is sandy clay loam or sandy loam.

Mystic clay loam, 9 to 14 percent slopes, severely eroded, is a taxadjunct because it has a lighter colored surface soil than is defined as the range for the series.

Nodaway Series

The Nodaway series consists of moderately well drained, moderately permeable soils on bottom land. These soils formed in stratified, silty alluvium. The native vegetation was prairie grasses and deciduous trees. Slopes range from 0 to 3 percent.

Typical pedon of Nodaway silt loam, in an area of Nodaway-Lawson-Ackmore silt loams, 0 to 2 percent slopes; 2,040 feet south and 1,060 feet west of the

northeast corner of sec. 2, T. 67 N., R. 13 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; common fine roots; neutral; abrupt smooth boundary.

C1—8 to 40 inches; stratified dark grayish brown (10YR 4/2), dark brown (10YR 4/3), grayish brown (10YR 5/2), and brown (10YR 5/3) silt loam; appears massive but has weak bedding planes; friable; few distinct light gray (10YR 7/2 dry) silt coatings; few fine roots; slightly acid; diffuse smooth boundary.

C2—40 to 60 inches; stratified dark grayish brown (10YR 4/2) and dark brown (10YR 4/3) silt loam; few medium distinct gray (10YR 5/1) mottles; appears massive but has weak bedding planes; friable; few light gray (10YR 7/2 dry) silt coatings; few dark concretions of iron and manganese oxide; few strata of loamy material; slightly acid.

The Ap horizon has chroma of 1 or 2. It is 6 to 10 inches thick. The C horizon is stratified. It has value of 3 to 5 and generally has chroma of 2 to 4. In some pedons, however, strata have chroma of 1. Some pedons have sandy strata below a depth of 40 inches. Some have dark buried soils below a depth of 36 inches.

Okaw Series

The Okaw series consists of poorly drained, very slowly permeable soils on low stream terraces. These soils formed in silty and clayey alluvium. The native vegetation was deciduous trees. Slopes range from 0 to 2 percent.

Typical pedon of Okaw silt loam, 0 to 2 percent slopes, 152 feet north and 567 feet east of the center of sec. 27, T. 69 N., R. 15 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; mixed with some streaks and pockets of light brownish gray (10YR 6/2) subsurface material; moderate fine and very fine granular structure; friable; few fine roots; very strongly acid; abrupt smooth boundary.

E—7 to 13 inches; light brownish gray (10YR 6/2) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate thin platy structure parting to moderate medium and fine granular; friable; few fine roots; few fine dark concretions of iron and manganese oxide; very strongly acid; clear wavy boundary.

2Btg1—13 to 24 inches; grayish brown (10YR 5/2) silty clay; common fine faint yellowish brown (10YR 5/4) and few fine distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; very firm; common distinct clay films on faces of peds; few fine roots; few fine dark concretions of iron and manganese oxide; strongly acid; clear smooth boundary.

2Btg2—24 to 34 inches; light brownish gray (10YR 6/2) silty clay; common fine distinct strong brown (7.5YR 4/6 and 5/6) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; very firm; common distinct clay films on faces of peds; few fine roots; few fine dark concretions of iron and manganese oxide; strongly acid; clear smooth boundary.

2Btg3—34 to 47 inches; light brownish gray (10YR 6/2) silty clay loam; common fine and medium distinct strong brown (7.5YR 4/6 and 5/6) mottles; weak fine and medium subangular blocky structure; firm; common distinct clay films on faces of peds; many fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

2C—47 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine and medium prominent strong brown (7.5YR 4/6 and 5/6) mottles; massive; firm; many fine dark concretions of iron and manganese oxide; neutral.

The solum ranges from 40 to 65 inches in thickness. The A or Ap horizon has value of 4 or 5 and chroma of 1 or 2. The E horizon has value of 4 to 7 and chroma of 1 or 2. The 2Btg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or less. It is silty clay loam, silty clay, or clay. The content of clay in the upper 20 inches of the argillic horizon is 35 to 48 percent.

Olmitz Series

The Olmitz series consists of moderately well drained, moderately permeable soils on slightly concave or plane foot slopes and alluvial fans. These soils formed in loamy local alluvium derived from glacial till. The native vegetation was tall prairie grasses. Slopes range from 2 to 5 percent.

Typical pedon of Olmitz loam, 2 to 5 percent slopes, 1,780 feet south and 2,210 feet east of the northwest corner of sec. 29, T. 68 N., R. 15 W.

Ap—0 to 10 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; slightly acid; clear smooth boundary.

A1—10 to 15 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; moderate fine and medium granular structure; friable; slightly acid; gradual smooth boundary.

A2—15 to 21 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; moderate very fine and fine subangular blocky structure; friable; slightly acid; gradual smooth boundary.

A3—21 to 30 inches; very dark grayish brown (10YR 3/2) clay loam, dark grayish brown (10YR 4/2) dry; common thick black (10YR 2/1) and very dark brown (10YR 2/2) coatings on faces of peds; moderate fine subangular blocky structure; friable; medium acid; gradual smooth boundary.

Bw1—30 to 38 inches; dark brown (10YR 3/3) clay loam; common thick very dark grayish brown (10YR 3/2) coatings on faces of peds; common fine faint brown (10YR 4/3) mottles; moderate fine and medium subangular blocky structure; friable; medium acid; gradual smooth boundary.

Bw2—38 to 44 inches; brown (10YR 4/3) clay loam; common thick dark brown (10YR 3/3) and very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; medium acid; gradual smooth boundary.

Bw3—44 to 50 inches; brown (10YR 4/3) clay loam; common dark brown (10YR 3/3) and very dark grayish brown (10YR 3/2) coatings on faces of peds; common fine distinct yellowish brown (10YR 5/6) and common fine faint dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; friable; few fine dark concretions of iron and manganese oxide; about 2 percent small pebbles; medium acid; gradual smooth boundary.

BC—50 to 60 inches; brown (10YR 4/3) clay loam; common dark brown (10YR 3/3) and very dark grayish brown (10YR 3/2) coatings on faces of peds; common fine prominent strong brown (7.5YR 5/6) and common fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine dark concretions of iron and manganese oxide; about 2 percent small pebbles; medium acid.

The solum ranges from 36 to 65 inches in thickness. The mollic epipedon is 24 to 32 inches thick. The A horizon has value of 2 or 3 and chroma of 1 or 2. It is loam or clay loam. The B horizon is dominantly clay loam in which the content of clay is 28 to 34 percent.

Perks Variant

The Perks Variant consists of somewhat excessively drained soils on bottom land. These soils formed in stratified, sandy and silty alluvium. They are rapidly permeable in the upper part and moderately permeable in the lower part. Vegetation has not influenced the formation of these soils. Slopes range from 0 to 2 percent.

Typical pedon of Perks Variant sand, 0 to 2 percent slopes, 2,165 feet north and 310 feet west of the southeast corner of sec. 10, T. 70 N., R. 13 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) sand, pale brown (10YR 6/3) dry; single grained; a few weak bedding planes; very friable; few fine roots; neutral; abrupt smooth boundary.

C1—7 to 21 inches; dark brown (10YR 4/3) sand; several bands of brown (10YR 5/3) material in the lower part; single grained; loose; few fine roots; medium acid; clear smooth boundary.

C2—21 to 26 inches; dark yellowish brown (10YR 4/4) sandy loam; single grained; very friable; few fine roots; medium acid; clear smooth boundary.

2A—26 to 41 inches; dark grayish brown (10YR 4/2) silt loam; few fine distinct dark brown (7.5YR 4/4) and common fine prominent dark reddish brown (5YR 3/4) mottles; weak medium subangular blocky structure; friable; few fine roots; slightly acid; gradual smooth boundary.

2Bg1—41 to 50 inches; dark gray (10YR 4/1) silty clay loam; many fine prominent dark reddish brown (5YR 3/3) mottles; weak medium subangular blocky structure; friable; few fine roots; slightly acid; diffuse smooth boundary.

2Bg2—50 to 60 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine prominent dark reddish brown (5YR 3/4) mottles; weak medium subangular blocky structure; friable; slightly acid.

The Ap horizon has value of 3 or 4 and chroma of 2 or 3. The C horizon is stratified. It has value of 4 or 5 and chroma of 3 to 6. It is sandy loam, sand, or loamy sand. The 2A and 2Bg horizons have hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. They are silt loam or silty clay loam. The depth to silt loam or silty clay loam ranges from 24 to 36 inches.

Pershing Series

The Pershing series consists of somewhat poorly drained or moderately well drained, slowly permeable soils on convex side slopes and ridgetops in the uplands and on high stream terraces. These soils formed in loess. The native vegetation was mixed prairie grasses and deciduous trees. Slopes range from 2 to 9 percent.

Typical pedon of Pershing silt loam, 2 to 5 percent slopes, 920 feet south and 660 feet east of the northwest corner of sec. 12, T. 70 N., R. 15 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; friable; slightly acid; clear smooth boundary.

E—8 to 11 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; common distinct very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) coatings on faces of peds; weak thick platy structure; friable; medium acid; clear smooth boundary.

BE—11 to 14 inches; brown (10YR 4/3) and dark grayish brown (10YR 4/2) silty clay loam; common distinct very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine distinct yellowish brown (10YR 5/6) mottles; moderate very fine subangular blocky structure; friable; common distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; strongly acid; clear smooth boundary.

Btg1—14 to 18 inches; grayish brown (2.5Y 5/2) silty clay; many fine distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

Btg2—18 to 24 inches; grayish brown (2.5Y 5/2) silty clay; common fine distinct yellowish brown (10YR 5/4 and 5/6) and strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

Btg3—24 to 30 inches; grayish brown (2.5Y 5/2) silty clay; common fine prominent yellowish brown (10YR 5/4 and 5/6) and strong brown (7.5YR 5/6) and common fine faint light brownish gray (2.5Y 6/2) mottles; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

Btg4—30 to 35 inches; light brownish gray (2.5Y 6/2) silty clay; common fine prominent yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) and common fine faint grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg5—35 to 41 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine prominent yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) and common fine faint grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg6—41 to 52 inches; light olive gray (5Y 6/2) silty clay loam; common fine prominent light olive brown (2.5Y 5/4), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/6) and common fine faint olive gray (5Y 5/2) mottles; moderate medium subangular blocky structure; friable; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

BCg—52 to 60 inches; light olive gray (5Y 6/2) silty clay loam; common fine prominent light olive brown (2.5Y 5/4), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/6) and common fine faint olive gray (5Y 5/2) mottles; weak medium subangular blocky structure; friable; common fine dark concretions of iron and manganese oxide; slightly acid.

The thickness of the solum ranges from 4 to 8 feet. The A or Ap horizon has chroma of 1 or 2. It is silt loam or silty clay loam. The E horizon has hue of 10YR or 2.5Y and value of 4 or 5. The Bt horizon has hue of 5Y, 2.5Y, or 10YR, value of 4 to 6, and chroma of 1 to 8. It is silty clay or silty clay loam. The content of clay in the finest textured part of this horizon is 42 to 48 percent.

Rathbun Series

The Rathbun series consists of somewhat poorly drained, very slowly permeable soils on convex side slopes and ridgetops in the uplands. These soils formed

in loess. The native vegetation was deciduous trees. Slopes range from 2 to 9 percent.

Typical pedon of Rathbun silt loam, 2 to 5 percent slopes, 570 feet south and 2,400 feet east of the northwest corner of sec. 3, T. 69 N., R. 13 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; some grayish brown (10YR 5/2) silt loam from the subsurface layer; moderate fine and medium granular structure; friable; few distinct white (10YR 8/1 dry) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; slightly acid; abrupt smooth boundary.

E—8 to 15 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; common fine faint brown (10YR 5/3) mottles; weak medium platy structure; friable; many distinct white (10YR 8/1 dry) silt coatings on faces of peds; common fine dark concretions of iron and manganese oxide; very strongly acid; clear smooth boundary.

BE—15 to 18 inches; brown (10YR 5/3) silty clay loam; common fine faint grayish brown (10YR 5/2) mottles; moderate very fine and fine subangular blocky structure; friable; common distinct white (10YR 8/1 dry) silt coatings on faces of peds; common fine dark concretions of iron and manganese oxide; very strongly acid; gradual smooth boundary.

Bt1—18 to 25 inches; dark grayish brown (10YR 4/2) silty clay; common fine distinct yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and brown (7.5YR 4/4) mottles; moderate fine subangular blocky structure; very firm; common distinct clay films on faces of peds; common distinct white (10YR 8/1 dry) silt coatings on faces of peds; common fine dark concretions of iron and manganese oxide; very strongly acid; gradual smooth boundary.

Bt2—25 to 32 inches; dark grayish brown (10YR 4/2) silty clay; common fine distinct yellowish brown (10YR 5/6), brown (7.5YR 4/4), and strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; very firm; common distinct clay films on faces of peds; few distinct white (10YR 8/1 dry) silt coatings on faces of peds; common fine dark concretions of iron and manganese oxide; very strongly acid; gradual smooth boundary.

Btg1—32 to 40 inches; grayish brown (2.5Y 5/2) silty clay; common fine distinct yellowish brown (10YR 5/4) and common fine prominent brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; common fine and medium dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

Btg2—40 to 54 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine prominent yellowish brown (10YR 5/4), brown (7.5YR 4/4), and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; common fine and medium dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

BCg—54 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6), brown (7.5YR 4/4), and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine and medium dark concretions of iron and manganese oxide; slightly acid.

The solum typically is more than 60 inches thick. The A or Ap horizon has value of 4 or 5 and chroma of 1 or 2. It is silt loam or silty clay loam. The E horizon has chroma of 2 to 4. The upper part of the Bt horizon has hue of 10YR or 2.5Y and value of 4 or 5. The lower part has hue of 2.5Y or 5Y, value of 5 or 6, and chroma of 2 or 3. The content of clay in the finest textured part of the Bt horizon is 48 to 56 percent.

Richwood Variant

The Richwood Variant consists of well drained, moderately permeable soils on low stream terraces. These soils formed in loamy alluvium. The native vegetation was tall prairie grasses. Slopes range from 1 to 3 percent.

Typical pedon of Richwood Variant loam, 1 to 3 percent slopes, 1,420 feet west and 2,140 feet south of the northeast corner of sec. 12, T. 70 N., R. 12 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; many very dark gray (10YR 3/1) coatings on faces of peds; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

A—9 to 14 inches; dark brown (10YR 3/3) loam, dark grayish brown (10YR 4/2) dry; many very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) coatings on faces of peds; weak very fine subangular blocky structure parting to weak fine

granular; friable; few fine roots; neutral; abrupt smooth boundary.

AB—14 to 20 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; some very dark gray (10YR 3/1) coatings on faces of peds; few dark brown (10YR 4/3) faces of peds; weak very fine subangular blocky structure parting to weak fine granular; friable; few fine roots; neutral; abrupt smooth boundary.

Bt1—20 to 27 inches; brown (10YR 4/3) loam; some very dark grayish brown (10YR 3/2) coatings on faces of peds; weak very fine subangular blocky structure; friable; few faint clay films on faces of peds; few fine roots; neutral; abrupt smooth boundary.

Bt2—27 to 50 inches; brown (10YR 4/3) loam; some dark brown (10YR 3/3) coatings on faces of peds; weak fine and very fine subangular blocky structure; friable; few faint clay films on faces of peds; few fine roots in the upper part; few fine dark concretions of iron and manganese oxide; neutral; gradual smooth boundary.

BC—50 to 60 inches; brown (10YR 4/3) loam; weak fine subangular blocky structure; friable; few fine dark concretions of iron and manganese oxide; neutral.

The solum ranges from 40 to 60 inches in thickness. The mollic epipedon is 10 to 24 inches thick. The Ap and A horizons have chroma of 1 to 3. The Bt horizon has value of 3 or 4 and chroma of 3 to 5. It is loam or silt loam. The BC horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 6. It is loam, sandy loam, or silt loam.

Rinda Series

The Rinda series consists of poorly drained, very slowly permeable soils on short, convex side slopes and convex nose slopes and in coves at the upper end of drainageways in the uplands. These soils formed in a paleosol weathered from glacial till. The native vegetation was mixed prairie grasses and deciduous trees. Slopes range from 5 to 9 percent.

Typical pedon of Rinda silty clay loam, 5 to 9 percent slopes, moderately eroded, 1,800 feet south and 234 feet west of the center of sec. 33, T. 69 N., R. 14 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, grayish brown (10YR 5/2) dry; mixed with some streaks and pockets of dark grayish brown (10YR 4/2) and dark brown (10YR 4/3) subsurface material; weak fine granular structure; friable; many fine and medium roots; slightly acid; abrupt smooth boundary.

2E—9 to 14 inches; dark grayish brown (10YR 4/2) silty clay loam; few very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine faint dark brown (10YR 4/3) mottles; very weak thin platy structure parting to weak fine granular; friable; many fine distinct silt coatings on faces of peds; many fine and medium roots; strongly acid; clear smooth boundary.

2Btg1—14 to 22 inches; dark grayish brown (10YR 4/2) clay; few fine distinct dark brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; very firm; many distinct clay films on faces of peds; many fine and medium roots; slightly acid; gradual smooth boundary.

2Btg2—22 to 32 inches; grayish brown (10YR 5/2) clay; common fine distinct strong brown (7.5YR 4/6) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; very firm; many distinct clay films on faces of peds; few fine roots; neutral; gradual smooth boundary.

2Btg3—32 to 41 inches; grayish brown (10YR 5/2) clay; many medium distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium subangular blocky structure; very firm; many distinct clay films on faces of peds; few fine roots; neutral; gradual smooth boundary.

2Btg4—41 to 53 inches; gray (10YR 6/1) clay; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; very firm; many distinct clay films on faces of peds; few fine roots; mildly alkaline; gradual smooth boundary.

2Btg5—53 to 60 inches; gray (10YR 5/1) clay; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; very firm; many distinct clay films on faces of peds; few fine dark concretions of iron and manganese oxide; mildly alkaline.

The solum typically is more than 60 inches thick. The upper 10 to 18 inches in most pedons formed in loess or silty sediments. The A or Ap horizon has chroma of 1 or 2. It is silty clay loam or silt loam. The 2E horizon has hue of 10YR or 2.5Y and value of 4 or 5. It is silty clay loam or silt loam. In some pedons it is incorporated into the Ap horizon. The 2Bt horizon has hue of 10YR or 5Y, value of 4 to 6, and chroma of 1 or 2. It is clay or silty clay. The content of clay in this horizon ranges from 45 to 58 percent.

Rinda silty clay loam, 5 to 9 percent slopes, severely eroded, is a taxadjunct because it has a lighter colored

surface soil than is defined as the range for the series.

Seymour Series

The Seymour series consists of somewhat poorly drained, very slowly permeable soils on convex ridgetops and the upper side slopes in the uplands. These soils formed in loess. The native vegetation was tall prairie grasses. Slopes range from 2 to 5 percent.

Typical pedon of Seymour silt loam, 2 to 5 percent slopes, 1,470 feet south and 60 feet east of the northwest corner of sec. 30, T. 68 N., R. 12 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine and medium granular structure; friable; neutral; clear smooth boundary.

A—8 to 13 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; moderate very fine and fine subangular blocky structure; friable; slightly acid; gradual smooth boundary.

AB—13 to 16 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; moderate very fine and fine subangular blocky structure; firm; few distinct dark gray (10YR 4/1) silt coatings on faces of peds; few fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Bt—16 to 18 inches; dark grayish brown (10YR 4/2) silty clay; common distinct very dark gray (10YR 3/1) coatings on faces of peds; common fine distinct yellowish brown (10YR 5/4) mottles; strong fine subangular blocky structure; very firm; common distinct clay films on faces of peds; few fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

Btg1—18 to 21 inches; dark grayish brown (2.5Y 4/2) silty clay; common distinct very dark gray (10YR 3/1) and black (10YR 2/1) coatings on faces of peds; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to strong fine and medium subangular blocky; very firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg2—21 to 28 inches; dark grayish brown (2.5Y 4/2) silty clay; many fine and medium distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to strong fine and medium subangular blocky; very firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg3—28 to 36 inches; grayish brown (2.5Y 5/2) silty clay; common fine and medium prominent yellowish brown (10YR 5/6) and brown (7.5YR 4/4) and common fine faint light olive brown (2.5Y 5/4) mottles; moderate medium prismatic structure parting to strong medium subangular blocky; very firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg4—36 to 53 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine and medium prominent strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) and common fine faint light olive brown (2.5Y 5/4) mottles; medium subangular blocky structure; firm; few distinct clay films on faces of peds; common fine and medium dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

BCg—53 to 60 inches; light olive gray (5Y 6/2) silty clay loam; common fine and medium prominent yellowish brown (10YR 5/6), light olive brown (2.5Y 5/4), and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine dark concretions of iron and manganese oxide; neutral.

The solum typically is more than 60 inches thick. The mollic epipedon is 10 to 18 inches thick. The A horizon has value of 2 or 3 and chroma of 1 or 2. It is silt loam or silty clay loam. The upper part of the Bt horizon has hue of 10YR or 2.5Y and value of 4 or 5. The lower part has hue of 2.5Y or 5Y and value of 5 or 6. The maximum content of clay in the Bt horizon is 50 to 55 percent.

Seymour silty clay loam, 2 to 5 percent slopes, moderately eroded, is a taxadjunct to the series because it does not have a mollic epipedon.

Shelby Series

The Shelby series consists of well drained, moderately slowly permeable soils on short, convex side slopes in the uplands. These soils formed in glacial till. The native vegetation was tall prairie grasses. Slopes range from 9 to 18 percent.

The Shelby soils in this county are taxadjuncts to the series because they do not have a mollic epipedon.

Typical pedon of Shelby loam, 9 to 14 percent

slopes, moderately eroded, 1,500 feet east and 530 feet north of the southwest corner of sec. 17, T. 68 N., R. 13 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) loam, dark grayish brown (10YR 4/2) dry; mixed with a few streaks and pockets of yellowish brown (10YR 5/4) subsoil material; weak very fine subangular blocky structure parting to moderate fine granular; friable; few fine roots; neutral; abrupt smooth boundary.

BA—9 to 14 inches; dark brown (10YR 4/3) clay loam; very dark grayish brown (10YR 3/2) coatings on faces of peds; weak fine and medium subangular blocky structure; friable; few fine roots; neutral; clear smooth boundary.

Bt1—14 to 24 inches; yellowish brown (10YR 5/4) clay loam; moderate medium and coarse subangular blocky structure; firm; common distinct clay films on faces of peds; few fine roots; medium acid; gradual smooth boundary.

Bt2—24 to 34 inches; yellowish brown (10YR 5/4) clay loam; moderate medium and coarse subangular blocky structure; firm; common distinct clay films on faces of peds; few fine roots; few fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Bt3—34 to 50 inches; yellowish brown (10YR 5/4) clay loam; few fine prominent strong brown (7.5YR 4/6) mottles; moderate medium and coarse subangular blocky structure; firm; common distinct clay films on faces of peds; few fine dark concretions of iron and manganese oxide; few soft accumulations of calcium carbonate; neutral; clear smooth boundary.

C—50 to 60 inches; yellowish brown (10YR 5/6) loam; few fine distinct strong brown (7.5YR 4/6) and common fine faint brownish yellow (10YR 6/8) mottles; massive; firm; few distinct brown (10YR 5/3) masses in root and worm channels; few fine dark concretions of iron and manganese oxide; mildly alkaline.

The solum ranges from 30 to 75 inches in thickness. The Ap or A horizon has value of 2 or 3 and chroma of 1 or 2. It is loam or clay loam. The Bt horizon has value of 3 to 5 and chroma of 3 or 4. The content of clay in the upper 20 inches of the B horizon is 32 to 35 percent.

Tuskeego Series

The Tuskeego series consists of poorly drained, very slowly permeable soils on low stream terraces. These soils formed in silty and clayey alluvium. The native vegetation was mixed prairie grasses and deciduous trees. Slopes range from 0 to 2 percent.

Typical pedon of Tuskeego silt loam, 0 to 2 percent slopes, 230 feet west and 360 feet south of the center of sec. 1, T. 67 N., R. 13 W.

A—0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak very fine subangular blocky structure parting to moderate fine granular; friable; common medium roots; slightly acid; abrupt smooth boundary.

AE—6 to 9 inches; dark grayish brown (10YR 4/2) silt loam; very dark grayish brown (10YR 3/2) coatings on faces of peds; weak thin platy structure parting to weak fine granular; friable; few fine roots; medium acid; clear smooth boundary.

E1—9 to 14 inches; grayish brown (10YR 5/2) silt loam; moderate thin platy structure; friable; few fine roots; medium acid; clear smooth boundary.

E2—14 to 21 inches; light brownish gray (10YR 6/2) silt loam; moderate thin platy structure; friable; few fine roots; strongly acid; clear smooth boundary.

Bg—21 to 24 inches; gray (10YR 5/1) silty clay loam; few fine distinct dark yellowish brown (10YR 4/6) mottles; moderate fine and medium subangular blocky structure; firm; few fine roots; strongly acid; clear smooth boundary.

Btg1—24 to 30 inches; dark gray (10YR 4/1) silty clay; common fine distinct dark yellowish brown (10YR 4/6) mottles; moderate fine and medium subangular blocky structure; very firm; few fine roots; medium acid; gradual smooth boundary.

Btg2—30 to 38 inches; dark gray (10YR 4/1) silty clay; few fine distinct dark yellowish brown (10YR 4/6) and brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; few fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg3—38 to 47 inches; dark gray (10YR 4/1) silty clay loam; common fine prominent dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; few fine roots; few fine dark concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

Btg4—47 to 60 inches; dark gray (10YR 4/1) silty clay loam; common fine prominent strong brown (7.5YR 4/6) mottles; moderate medium subangular blocky structure; firm; few fine dark concretions of iron and manganese oxide; slightly acid.

The solum ranges from 48 to 72 inches in thickness. The A or Ap horizon has chroma of 1 or 2. The E horizon has value of 4 to 6 and chroma of 1 or 2. It is 8 to 12 inches thick. The Btg horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 1 or 2. It is silty clay loam or silty clay.

Vesser Series

The Vesser series consists of poorly drained, moderately permeable soils in the higher areas of bottom land and on foot slopes and alluvial fans. These soils formed in silty alluvium. The native vegetation was prairie grasses tolerant of wetness. Slopes range from 0 to 5 percent.

Typical pedon of Vesser silt loam, 0 to 2 percent slopes, 430 feet east and 520 feet north of the center of sec. 27, T. 69 N., R. 15 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine and very fine granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

A—9 to 18 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine and very fine subangular blocky structure; friable; few fine roots; slightly acid; gradual smooth boundary.

E1—18 to 24 inches; dark gray (10YR 4/1) silt loam; common fine distinct dark brown (7.5YR 3/2) and few fine faint gray (10YR 6/1) mottles; weak fine subangular blocky structure; friable; few fine roots; few fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

E2—24 to 37 inches; dark gray (10YR 4/1) silt loam; few fine distinct dark brown (7.5YR 3/3), common fine distinct dark yellowish brown (10YR 4/4), and common fine faint light gray (10YR 6/1) mottles; weak medium platy structure parting to weak medium subangular blocky; friable; few fine roots; few fine dark concretions of iron and manganese oxide; strongly acid; clear smooth boundary.

Btg1—37 to 47 inches; gray (10YR 5/1) silty clay loam; common fine faint light gray (10YR 6/1), few fine distinct dark yellowish brown (10YR 4/4), and common fine prominent strong brown (7.5YR 4/6) mottles; moderate medium subangular blocky structure; firm; few distinct clay films on faces of peds and in root channels; few distinct light gray (10YR 7/1 dry) silt coatings and uncoated very fine sand grains on faces of peds; few fine roots; few fine dark concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

Btg2—47 to 55 inches; dark gray (10YR 4/1) silty clay loam; common fine faint light gray (10YR 6/1), few fine distinct dark brown (7.5YR 3/3), and common fine distinct brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; firm; few distinct clay films on faces of peds; few fine dark concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

BCg—55 to 60 inches; very dark gray (10YR 3/1) silty clay loam; few fine distinct dark brown (7.5YR 3/2) mottles; weak medium subangular blocky structure; firm; medium acid.

The solum typically is more than 60 inches thick. The A horizon has value of 2 or 3 and chroma of 1 or 2. The E horizon has value of 3 to 5 and chroma of 1 or 2. The Btg horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 or 2. The content of clay in the upper 20 inches of this horizon is 30 to 35 percent.

Weller Series

The Weller series consists of moderately well drained, slowly permeable soils on convex side slopes and ridgetops in the uplands and on high stream benches. These soils formed in loess. The native vegetation was deciduous trees. Slopes range from 2 to 9 percent.

Typical pedon of Weller silt loam, 2 to 5 percent slopes, 1,630 feet north and 1,250 feet west of the southeast corner of sec. 7, T. 70 N., R. 15 W.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate very fine and fine granular structure; friable; very strongly acid; clear smooth boundary.

E1—3 to 6 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; common dark grayish brown (10YR 4/2) coatings on faces of peds; common fine faint brown (10YR 4/3) mottles; weak medium platy structure parting to moderate fine granular; friable; very strongly acid; gradual smooth boundary.

E2—6 to 14 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; common fine faint dark yellowish brown (10YR 4/4) mottles; weak medium platy structure parting to weak fine subangular blocky; friable; common distinct white (10YR 8/2 dry) silt coatings on faces of peds; very strongly acid; gradual smooth boundary.

EB—14 to 17 inches; yellowish brown (10YR 5/4) silty

clay loam; common fine faint yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/4) mottles; moderate fine subangular blocky structure; friable; few distinct clay films on faces of peds; common distinct very pale brown (10YR 7/3 dry) silt coatings on faces of peds; very strongly acid; gradual smooth boundary.

Bt1—17 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct brown (7.5YR 4/4) mottles; strong fine subangular blocky structure; firm; common distinct clay films on faces of peds; common distinct white (10YR 8/1 dry) silt coatings on faces of peds; very strongly acid; clear smooth boundary.

Bt2—20 to 24 inches; yellowish brown (10YR 5/4) silty clay; common fine distinct grayish brown (10YR 5/2) and brown (7.5YR 4/4) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular and angular blocky; firm; common distinct clay films on faces of peds; few distinct white (10YR 8/1 dry) silt coatings on faces of peds; few very fine and fine dark concretions of iron and manganese oxide; very strongly acid; gradual smooth boundary.

Bt3—24 to 28 inches; yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) silty clay; common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common distinct clay films on faces of peds; few fine dark concretions of iron and manganese oxide; very strongly acid; gradual smooth boundary.

Bt4—28 to 32 inches; yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) silty clay; common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; very strongly acid; gradual smooth boundary.

Btg1—32 to 38 inches; grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) silty clay loam; common fine prominent strong brown (7.5YR 5/6) and common fine faint light olive brown (2.5Y 5/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; very strongly acid; gradual smooth boundary.

Btg2—38 to 48 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine and medium distinct yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and light olive brown (2.5Y 5/4) mottles; moderate medium subangular blocky structure; friable; few distinct clay films on faces of peds; common fine dark concretions of iron and manganese oxide; very strongly acid; gradual smooth boundary.

BCg—48 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and light olive brown (2.5Y 5/4) mottles; weak medium subangular blocky structure; friable; common fine dark concretions of iron and manganese oxide; strongly acid.

The solum ranges from 48 to more than 72 inches in thickness. The A or Ap horizon has value of 3 or 4 and chroma of 1 or 2. In areas where it has been mixed with the B horizon, the Ap horizon is silt loam or silty clay loam. The upper part of the Bt horizon has value of 4 or 5 and chroma of 3 or 4. The lower part has value of 4 to 6 and chroma of 2 to 6. The content of clay in the finest textured part of the Bt horizon is 42 to 48 percent.

Zook Series

The Zook series consists of poorly drained, slowly permeable soils on bottom land. These soils formed in alluvium. The native vegetation was swamp grasses, sedges, and prairie grasses tolerant of wetness. Slopes range from 0 to 2 percent.

Typical pedon of Zook silty clay loam, 0 to 2 percent slopes, 1,560 feet south and 1,000 feet west of the northeast corner of sec. 14, T. 70 N., R. 15 W.

Ap—0 to 9 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few fine roots; medium acid; abrupt smooth boundary.

A1—9 to 18 inches; black (N 2/0) silty clay, very dark gray (10YR 3/1) dry; weak medium subangular blocky structure; friable; common distinct shiny faces on peds; few fine roots; medium acid; gradual smooth boundary.

A2—18 to 30 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; friable; common distinct shiny faces on peds; few fine roots; slightly acid; gradual smooth boundary.

Bg1—30 to 37 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; moderate medium

subangular blocky structure; friable; common distinct shiny faces on peds; few fine roots; neutral; gradual smooth boundary.

Bg2—37 to 43 inches; dark gray (10YR 4/1) silty clay loam; few fine distinct brown (10YR 4/3) and few fine faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; common distinct shiny faces on peds; neutral; clear smooth boundary.

Cg—43 to 60 inches; dark gray (10YR 4/1) silty clay loam; common fine and medium distinct dark yellowish brown (10YR 4/4 and 4/6) and strong brown (7.5YR 5/6) mottles; massive; firm; neutral.

The solum ranges from 36 to 60 inches in thickness. The thickness of the mollic epipedon ranges from 36 to 50 inches. The texture of these soils generally is silty clay loam or silty clay, but in some pedons the surface layer is overwash of silt loam. The content of clay is 32 to 45 percent. The Bg and Cg horizons have hue of 10YR to 5Y and value of 2 to 5. The Bg horizon is 10 to 20 inches thick.

Formation of the Soils

The paragraphs that follow relate the major factors of soil formation to the soils in Davis County. They also describe the processes of horizon differentiation.

Factors of Soil Formation

Soil forms through processes that act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plantlife on and in the soil; the relief, or lay of the land; and the length of time that the forces of soil formation have acted on the soil material *(7)*. Human activities also affect soil formation.

Climate and plantlife are the active factors of soil formation. They act on the parent material and slowly change it into a natural body that has genetically related horizons. The effects of climate and plantlife are conditioned by relief. The parent material affects the kind of profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for the transformation of the parent material into a soil. Some time is always needed for the development of soil horizons. A long period is needed for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the others.

Parent Material and Geology

In Davis County parent material has affected the general character of the soil profile. Most of the soils in the county formed in glacial till, or ice-laid material; loess, or windblown material; and alluvium, or water-laid material. In some areas the soil is formed in material weathered from shale.

Glacial till.—In Davis County the major Pleistocene deposits of pre-Wisconsin age are Nebraskan and Kansan drift *(19)*. The Kansan drift is identifiable throughout the county. On side slopes it forms an extensive part of the landscape. The Nebraskan drift, however, is not readily identifiable on the surface in the county.

In some deep road cuts and along some of the major stream valleys, the Aftonian paleosol is below the Kansan glacial till *(8, 9)*. It consists mainly of glacial till made up of coarse fragments in a clay loam matrix. The upper part of this till consists of yellowish brown material that is oxidized and leached. Below this zone is dark gray material that is calcareous, contains limestone and dolomite particles, and is neither oxidized nor leached.

Soils formed on the Kansan till plain during the Yarmouth and Sangamon interglacial ages, before loess was deposited. On nearly level interstream divides, the soils were strongly weathered and had a gray, plastic subsoil consisting of a paleosol. This gumbotil is several feet thick and is very slowly permeable. Ashgrove, Clarinda, and Rinda soils formed in this paleosol. They are extensive throughout Davis County.

Geologic erosion has cut below the Yarmouth-Sangamon paleosol and into the Kansan till and older deposits. Generally, a stone line or subjacent till that is overlain by pedisediment is at the depth to which this erosion has cut *(14, 16)*. A paleosol formed in the pedisediment stone line and in the subjacent till. Adair, Armstrong, and Keswick soils formed in this material.

Geologic erosion removed the loess from many slopes and exposed strongly eroded, weathered paleosols. In some places, the paleosols have been beveled or truncated and only the lower part of the strongly weathered material remains. In other places erosion removed all the paleosols and exposed till that is only slightly weathered. Erosion cut through below the Yarmouth-Sangamon paleosol during the Late Sangamon period *(14, 15)*. The material below the paleosol consists of loamy sediment over a stone line that, in turn, is over a highly weathered, clayey, reddish brown, acid till. Material that formed in the Late

Sangamon period is exposed on the narrow, slightly lower interstream divides on some side slopes.

Adair, Armstrong, and Keswick soils formed in the Late Sangamon material. Caleb, Douds, Galland, and Mystic soils formed in pre-Sangamon sediments of valley fills. These sediments are old alluvium of glacial origin and have varying textures *(15)*. Caleb, Douds, Galland, and Mystic soils are on low, stepped interfluves above the present drainage system. They owe their landscape partly to valley fill, but their surface layer merges with the present erosional uplands. These soils are in distinctly higher positions on the landscape than the soils on flood plains, but they are lower on the landscape than Gara, Shelby, and Lindley soils, which formed on dissection slopes of Late Wisconsin age. The Sangamon erosional sediments apparently have been angularly truncated in many places. As a result, they generally consist of an irregular mixture of materials that have contrasting textures.

Loess.—Loess of Wisconsin age covers most of Davis County. It is an extensive parent material in the county *(17, 18)*. It consists of accumulated particles of silt and clay that have been deposited by the wind. Variations in soils are related to the distance of the soils from the source of the loess. The source of loess in Davis County is probably the bottom land along the Missouri River in the western part of Iowa *(6)*.

On the stable upland divides, the loess is about 6 to 8 feet thick. It is slightly thicker in the northern part of the county, where Grundy, Pershing, and Weller are the dominant soils that formed in loess. In the southern part, Edina, Seymour, Kniffin, and Rathbun soils are the dominant soils that formed in loess. Appanoose, Beckwith, and Belinda soils also formed in loess. Many of the high benches along Soap Creek are covered with loess. The loess on these benches contains slightly less clay and slightly more sand than does the loess covering the uplands. The soil material underlying the loess in these areas is stratified alluvium that is generally high in content of sand and gravel.

Alluvium.—Alluvium consists of sediments that have been laid down by water. As these sediments move, they are sorted to some extent, but they are as well sorted as loess in only a few places. Also, alluvium does not have the wide range of particle sizes that occurs in glacial drift. The alluvium in Davis County is derived from loess and glacial drift, so it is mainly a mixture of silt and clay, of silt and sand, or of sand and gravel. The coarse sand and gravel generally are only in the pre-Sangamon alluvial sediments on the stream benches. Sediments accumulated at the foot of the slope on which they originated are called colluvium, or local alluvium.

The soils on flood plains, bottom lands, and along drainageways formed in alluvium. As the river overflows its channel and the water spreads over the flood plains, coarse textured material, such as sand and coarse silt, are deposited first. As the floodwater spreads, it moves more slowly and finer textured sediments are deposited. As the floodwater recedes, the clay particles, which are the finest textured particles, settle from the water that is left standing on the lowest part of the flood plain.

Floris, Nodaway, Amana, and Perks Variant soils commonly are closest to the stream channel and are coarser textured than the other soils on bottom land. Coppock, Richwood Variant, and Zook soils are fairly extensive along the Des Moines River and Soap Creek, where they are commonly away from the meanders of the stream. Zook soils commonly are on the lower part of the bottom land and are the finest textured alluvial soils in the county. Coppock and Vesser soils are widely distributed throughout the county. In places they formed in local alluvium at the base of upland slopes. Chequest, Humeston, Lawson, Tuskeego, and Vesser soils are along the smaller streams in the county. Cantril and Olmitz are the dominant soils that formed in local alluvium in the county. They commonly contain more sand than the other soils that formed in alluvium.

Shale residuum.—The oldest parent material in the county is a series of shale beds deposited during the Des Moines sedimentary cycle in the Pennsylvanian period. These beds consist of shale of different colors and textures, conglomerates, and a few organic layers, such as coal. These layers or beds have a very wide range of thickness.

Soils that formed in shale residuum in southern Iowa have a wide range of texture, reaction, and other characteristics. Colors of the shale range from nearly black to red, but red, brown, and grayish colors are dominant. Thin beds of sandstone and coal are between the layers of shale in places. Gosport soils formed in materials weathered from brownish and grayish shale.

In some areas, streams are still cutting through shale and flood plains are narrower and have a steeper gradient. The soils in the Nodaway-Cantril complex are commonly on these flood plains.

Climate

The soils in Davis County have been forming under a midcontinental, subhumid climate for the past 5,000 years *(14, 17)*. The morphology and properties of most

of the soils indicate that this climate was similar to the present climate. From 6,500 to 16,000 years ago, however, the climate probably was cool and moist and was conducive mainly to the growth of forest vegetation *(14, 17)*. A study indicates that the climate during the Sangamon period of the Pleistocene epoch was cool and moist and was conducive mainly to the growth of conifers *(10)*.

The influence of the general climate in a region is modified by local conditions in or near the developing soils. For example, soils on south-facing slopes formed under a microclimate that was warmer and drier than the average climate of nearby areas. Low-lying, poorly drained soils on bottom land formed under a wetter and colder climate than that in most of the surrounding areas. These local differences influence the characteristics of the soil and account for some of the differences among soils in the same general climatic region.

Vegetation

Many changes in climate and vegetation took place in Iowa during the postglacial period *(10, 14)*. Spruce grew on the soils from 12,000 to 8,000 years ago, followed by a coniferous-deciduous forest, which lasted until about 6,500 years ago. Then grass began to dominate in the state.

For the past 5,000 years, the soils in Davis County seem to have been influenced by prairie grasses and trees. Big bluestem and little bluestem were the main prairie grasses. The dominant trees were deciduous, mainly oak, hickory, ash, elm, and maple.

The effects of vegetation on soils similar to those in Davis County have been studied recently. Evidence shows that the vegetation changed while soils formed in areas bordering trees and grasses. The morphology of Appanoose, Armstrong, Belinda, Caleb, Gara, Kniffin, Mystic, Pershing, and Rinda soils reflects the influence of trees and grasses. Trees influenced the formation of Ashgrove, Beckwith, Douds, Galland, Lindley, Rathbun, and Weller soils *(13)*. Grasses influenced the formation of Adair, Clarinda, Edina, Grundy, Haig, Lawson, Seymour, Shelby, Vesser, and Zook soils.

Soils that formed under trees are lighter in color and more acid than soils that formed under grasses and have a thinner surface layer. The soils in Davis County that formed under changing vegetation or mixed grasses and trees have properties that are intermediate between those of soils that formed under grasses and those of soils that formed under trees.

Relief

Relief is an important cause of differences among soils. It indirectly influences soil formation through its effect on drainage. In Davis County the slope of the soils ranges from level to very steep. In many areas on bottom land, the nearly level soils are frequently flooded and have a permanently or periodically high water table. In depressions water soaks into the nearly level soils that are subject to flooding. Much of the rainfall runs off the steep soils on uplands.

Level soils are on broad upland flats and on the stream bottoms. The steepest soils in the county are generally on the southern and western sides of the major streams and their tributaries. The intricate pattern of upland drainageways indicates that the landscape in nearly the entire county has been modified by geologic processes.

Belinda, Edina, Haig, and Zook soils, which formed in areas where the water table is high, have a dominantly grayish subsoil. Adair, Grundy, Pershing, Seymour, and similar soils formed in areas where the water table fluctuated and was periodically high. Gara, Lindley, and other soils that formed in areas where the water table was below the subsoil have a yellowish brown subsoil. Haig, Zook, and other soils formed under prairie grasses and have a high water table. They contain more organic matter in the surface layer than well drained soils that formed under prairie grasses. Clay accumulates in the subsoil of Edina and other soils that are slightly depressional or nearly level. A large amount of water enters the soils and carries the clay particles downward. Edina soils are commonly considered "claypan" soils because they have a very slowly permeable subsoil, in which the greatest amount of clay accumulates.

Pershing and Weller soils were studied to determine the effect of relief on soils. From the stable slopes to the unstable slopes of these soils, tests showed an increase in content of clay in the A horizon and a decrease in thickness of the A horizon. More soil formation has taken place on the more stable slopes.

In Gara, Lindley, Shelby, and similar soils that have a wide range in slope and are on many kinds of slopes, the depth to carbonates is shallowest where the slopes are steepest, are convex, or are most unstable.

Time

The length of time required for a soil to form affects the kind of soil that forms. An older or more strongly developed soil has well defined genetic horizons,

whereas a less well developed soil has no genetic horizons or only weakly defined ones. Most soils on flood plains are weakly developed because they have not been in place long enough for distinct horizons to develop.

On the steeper soils, material is generally removed before a thick profile that has strongly defined horizons has had time to develop. Even though the material has been in place for a long time, the soils may be immature because much of the water runs off the slopes rather than through the soil material. Shelby, Gara, and Lindley soils formed on recently dissected slopes of late Wisconsin age *(14, 15)*. These soils are no older than 11,000 to 14,000 years and probably are much younger.

Adair, Armstrong, Keswick, Clarinda, and Mystic soils are among the oldest soils in the county *(15, 18)*. Clarinda soils formed in Kansan glacial till during the Yarmouth-Sangamon period. Adair, Armstrong, Keswick, and Mystic soils formed in material deposited during the Late Sangamon interglacial stage. This material is much older than the loessial parent material of the Appanoose, Beckwith, Belinda, Edina, Haig, Grundy, Kniffin, Pershing, Rathbun, Seymour, and Weller soils. These soils are no older than 14,000 to 16,000 years, and they may be considerably younger *(15)*.

Radiocarbon studies of wood fragments and organic matter in loess and glacial till have made it possible to determine the approximate ages of soils and loess and glacial deposits in Iowa. In Davis County, the loess is thickest in the nearly level soils on stable upland divides. It is underlain by a Yarmouth-Sangamon paleosol that is on the Kansan till surface. In many places below the stable uplands, an organic layer is at the base of the loess. Organic matter below the solum of the Edina and Haig soils in Wayne County, Iowa, had radiocarbon ages of 19,000 to 20,000 years. The Kansan till surface is 8 feet below the present land surface.

Human Activities

Important changes take place when the soil is cultivated. Some of these changes have little effect on productivity; others have a drastic effect. The changes caused by water erosion generally are the most significant. On many of the cultivated soils in the county, particularly the gently rolling to hilly soils, part or all of the original surface layer has been lost through sheet erosion. In places shallow to deep gullies have formed.

In many fields that are cultivated year after year, the granular structure that was apparent when the grassland was undisturbed has broken down. In these fields the surface tends to crust and harden when it dries. Fine textured soils that have been plowed when too wet tend to puddle and are less permeable than similar soils in undisturbed areas.

Humans have increased the productivity of some soils. Large areas of bottom land have been made suitable for cultivation because drainage ditches have been dug and diversions have been constructed at the foot of slopes. The cropland in areas of Edina and Haig soils on broad flats has been greatly improved because a drainage system has been installed.

Deficiencies in plant nutrients have been counteracted in some areas. Some soils are more productive than they were in their natural state because of applications of commercial fertilizer.

Processes of Horizon Differentiation

Horizons are differentiated from each other when four basic kinds of change take place. These are additions, removals, transfers, and transformations *(20)*. Each of these kinds of change affects many substances in the soils, such as organic matter, soluble salts, carbonates, sesquioxides, and silicate clay minerals. Most of these processes tend to promote horizon differentiation, but some tend to offset or retard it. The processes and the resulting changes occur simultaneously in soils. The ultimate nature of the profile is governed by the balance of these changes within the soil.

An accumulation of organic matter generally is an early phase of horizon differentiation. It has been an important process in the differentiation of horizons in the soils of Davis County. The amount of organic matter that has accumulated in the surface layer of the soils ranges from high to very low. In some soils the content of organic matter formerly was fairly high but is now low because of erosion.

The removal of substances from parts of the soil profile is important in the differentiation of horizons. The downward movement of calcium carbonates and bases is an example. The upper part of the soils in Davis County has been leached of calcium carbonates. Many soils have been so strongly leached that they are strongly acid or very strongly acid even in the subsoil.

Phosphorus is removed from the subsoil by plant roots and transferred to the parts of the plant growing above the ground. It is then returned to the surface layer in the plant residue. This process affects the form and distribution of phosphorus in the profile. The translocation of silicate clay minerals is another

important process. The clay minerals in the surface layer are carried downward in suspension by percolating water. They accumulate in the subsoil as fillings in pores and root channels and as clay films. This process has affected many of the soils in the county. In other soils, however, the clay content of the surface layer is not markedly different from that of the underlying layer and other evidence of clay movement is minimal.

Another kind of transfer occurs when cracks form as a result of shrinking and swelling. Because of the cracks, some of the material from the surface layer is transferred to the lower parts of the profile. This transfer is minimal in most soils. It is most common in very clayey soils. It can occur in Clarinda and Zook soils.

Transformations are physical and chemical. The weathering of soil particles to smaller sizes is an example of transformation. The reduction of iron is another example. This process is called gleying. It occurs when the soil is saturated for long periods. The soil contains enough organic matter for biological activity to take place during periods of saturation. Gleying is evidenced by ferrous iron and gray colors in the soil. It is a characteristic of poorly drained soils, such as Haig soils. The content of reductive extractable iron, or free iron, generally is lower in somewhat poorly drained soils, such as Seymour soils *(24)*. Another kind of transformation is the weathering of the primary apatite minerals in the parent material to secondary phosphorus compounds.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles

(flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Green manure crop (agronomy). A soil-improving crop

grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Gumbotil. Leached, deoxidized clay containing siliceous stones; the product of thorough chemical decomposition of clay-rich glacial till.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely

spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Paleosol. A buried soil or formerly buried soil, especially one that formed during an interglacial period and was covered by deposits of later glaciers.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material).

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. Water-sorted sediment at the top of a paleosol.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the

saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are—

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the

swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It

includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent.—A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, perched.—A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-84 at Bloomfield, Iowa)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	31.0	11.7	21.4	58	0	0	1.23	0.36	1.94	3	8.8
February----	37.5	17.7	27.6	64	0	10	1.10	.51	1.60	3	6.1
March-------	47.7	27.1	37.4	78	0	38	2.56	1.20	3.73	5	5.1
April-------	62.9	40.2	51.6	86	19	134	3.82	2.24	5.22	7	1.7
May---------	73.8	50.4	62.1	90	32	382	3.96	2.24	5.48	8	.0
June--------	82.9	59.9	71.4	95	43	642	4.52	2.29	6.46	7	.0
July--------	87.6	63.9	75.8	101	48	800	4.20	1.85	6.20	6	.0
August------	85.5	61.7	73.6	100	45	732	4.61	1.69	7.04	6	.0
September---	77.4	53.1	65.3	94	33	459	4.02	1.77	5.93	7	.0
October-----	66.8	42.5	54.7	88	21	192	3.05	.96	4.77	5	.3
November----	50.7	30.0	40.4	75	6	17	1.91	.58	2.98	4	1.9
December----	36.7	18.8	27.8	66	6	7	1.55	.58	2.34	4	6.5
Yearly:											
Average----	61.7	39.8	50.8	---	---	---	---	---	---	---	---
Extreme----	---	---	---	102	6	---	---	---	---	---	---
Total------	---	---	---	---	---	3,413	36.53	29.26	43.07	65	30.4

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-84 at Bloomfield, Iowa)

Probability	Temperature		
	24^{o} F or lower	28^{o} F or lower	32^{o} F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 19	Apr. 26	May 7
2 years in 10 later than--	Apr. 14	Apr. 21	May 3
5 years in 10 later than--	Apr. 5	Apr. 12	Apr. 24
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 17	Oct. 13	Sept. 25
2 years in 10 earlier than--	Oct. 21	Oct. 17	Sept. 30
5 years in 10 earlier than--	Oct. 30	Oct. 25	Oct. 11

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-84 at Bloomfield, Iowa)

Probability	Daily minimum temperature during growing season		
	Higher than 24^{o} F	Higher than 28^{o} F	Higher than 32^{o} F
	Days	Days	Days
9 years in 10	188	180	150
8 years in 10	194	185	157
5 years in 10	207	195	169
2 years in 10	220	205	181
1 year in 10	227	211	187

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
13B	Olmitz-Vesser-Zook complex, 0 to 5 percent slopes	19,500	6.0
24D2	Shelby loam, 9 to 14 percent slopes, moderately eroded	570	0.2
24E2	Shelby loam, 14 to 18 percent slopes, moderately eroded	580	0.2
51	Vesser silt loam, 0 to 2 percent slopes	3,300	1.0
51+	Vesser silt loam, overwash, 0 to 2 percent slopes	1,040	0.3
51B	Vesser silt loam, 2 to 5 percent slopes	400	0.1
51B+	Vesser silt loam, overwash, 2 to 5 percent slopes	200	0.1
54	Zook silty clay loam, 0 to 2 percent slopes	2,630	0.8
54+	Zook silt loam, overwash, 0 to 2 percent slopes	760	0.2
56B	Cantril loam, 2 to 5 percent slopes	310	0.1
58D2	Douds loam, 9 to 14 percent slopes, moderately eroded	230	0.1
65E	Lindley loam, 14 to 18 percent slopes	1,120	0.3
65E2	Lindley loam, 14 to 18 percent slopes, moderately eroded	5,150	1.6
65F	Lindley loam, 18 to 40 percent slopes	11,450	3.5
65F2	Lindley loam, 18 to 25 percent slopes, moderately eroded	7,900	2.4
80B	Clinton silt loam, 2 to 5 percent slopes	360	0.1
80C	Clinton silt loam, 5 to 9 percent slopes	200	0.1
80C2	Clinton silt loam, 5 to 9 percent slopes, moderately eroded	870	0.3
80D2	Clinton silt loam, 9 to 14 percent slopes, moderately eroded	200	0.1
93D2	Adair-Shelby complex, 9 to 14 percent slopes, moderately eroded	730	0.2
94E2	Caleb-Mystic complex, 14 to 18 percent slopes, moderately eroded	400	0.1
130	Belinda silt loam, 0 to 2 percent slopes	670	0.2
131B	Pershing silt loam, 2 to 5 percent slopes	1,570	0.5
131C2	Pershing silty clay loam, 5 to 9 percent slopes, moderately eroded	2,210	0.7
132B	Weller silt loam, 2 to 5 percent slopes	1,490	0.5
132C	Weller silt loam, 5 to 9 percent slopes	2,630	0.8
132C2	Weller silty clay loam, 5 to 9 percent slopes, moderately eroded	5,550	1.7
179D2	Gara loam, 9 to 14 percent slopes, moderately eroded	6,250	1.9
179E	Gara loam, 14 to 18 percent slopes	830	0.3
179E2	Gara loam, 14 to 18 percent slopes, moderately eroded	15,280	4.6
179E3	Gara clay loam, 14 to 18 percent slopes, severely eroded	890	0.3
179F	Gara loam, 18 to 25 percent slopes	1,010	0.3
179F2	Gara loam, 18 to 25 percent slopes, moderately eroded	2,480	0.8
179F3	Gara clay loam, 18 to 25 percent slopes, severely eroded	430	0.1
192C2	Adair clay loam, 5 to 9 percent slopes, moderately eroded	1,380	0.4
192D2	Adair clay loam, 9 to 14 percent slopes, moderately eroded	1,090	0.3
211	Edina silt loam, 0 to 1 percent slopes	22,940	7.0
222C2	Clarinda silty clay loam, 5 to 9 percent slopes, moderately eroded	14,440	4.4
222C3	Clarinda silty clay loam, 5 to 9 percent slopes, severely eroded	220	0.1
223C2	Rinda silty clay loam, 5 to 9 percent slopes, moderately eroded	17,870	5.5
223C3	Rinda silty clay loam, 5 to 9 percent slopes, severely eroded	210	0.1
260	Beckwith silt loam, 0 to 2 percent slopes	360	0.1
261	Appanoose silt loam, 0 to 2 percent slopes	4,450	1.4
263	Okaw silt loam, 0 to 2 percent slopes	570	0.2
269	Humeston silt loam, 0 to 2 percent slopes	1,070	0.3
273B	Olmitz loam, 2 to 5 percent slopes	510	0.2
312B	Seymour silt loam, 2 to 5 percent slopes	19,370	5.8
312B2	Seymour silty clay loam, 2 to 5 percent slopes, moderately eroded	1,600	0.5
313E2	Gosport silt loam, 9 to 18 percent slopes, moderately eroded	350	0.1
313G	Gosport silt loam, 18 to 40 percent slopes	560	0.2
313G2	Gosport silt loam, 18 to 40 percent slopes, moderately eroded	360	0.1
362	Haig silt loam, 0 to 2 percent slopes	1,550	0.5
364B	Grundy silt loam, 2 to 5 percent slopes	1,200	0.4
405	Floris silt loam, 0 to 2 percent slopes	1,980	0.6
423D2	Bucknell silty clay loam, 9 to 14 percent slopes, moderately eroded	3,880	1.2
423D3	Bucknell silty clay loam, 9 to 14 percent slopes, severely eroded	230	0.1
424D2	Lindley-Keswick loams, 9 to 14 percent slopes, moderately eroded	2,450	0.8
424E2	Lindley-Keswick loams, 14 to 18 percent slopes, moderately eroded	820	0.3
425C	Keswick loam, 5 to 9 percent slopes	530	0.2
425C2	Keswick loam, 5 to 9 percent slopes, moderately eroded	2,460	0.8
425D	Keswick loam, 9 to 14 percent slopes	3,460	1.1
425D2	Keswick loam, 9 to 14 percent slopes, moderately eroded	9,930	3.0
425D3	Keswick clay loam, 9 to 14 percent slopes, severely eroded	530	0.2
430	Ackmore silt loam, 0 to 2 percent slopes	640	0.2
451D2	Caleb loam, 9 to 14 percent slopes, moderately eroded	210	0.1

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
452C2	Lineville silt loam, 5 to 9 percent slopes, moderately eroded	820	0.3
453	Tuskeego silt loam, 0 to 2 percent slopes	960	0.3
484	Lawson silt loam, 0 to 2 percent slopes	760	0.2
520	Coppock silt loam, 0 to 2 percent slopes	1,530	0.5
520B	Coppock silt loam, 2 to 5 percent slopes	370	0.1
531B	Kniffin silt loam, 2 to 5 percent slopes	19,250	5.6
531C	Kniffin silt loam, 5 to 9 percent slopes	390	0.1
531C2	Kniffin silty clay loam, 5 to 9 percent slopes, moderately eroded	3,400	1.0
532B	Rathbun silt loam, 2 to 5 percent slopes	700	0.2
532C	Rathbun silt loam, 5 to 9 percent slopes	410	0.1
532C2	Rathbun silty clay loam, 5 to 9 percent slopes, moderately eroded	1,170	0.4
587	Chequest silty clay loam, 0 to 2 percent slopes	2,860	0.9
592C2	Mystic silt loam, 5 to 9 percent slopes, moderately eroded	440	0.1
592D2	Mystic silt loam, 9 to 14 percent slopes, moderately eroded	2,850	0.9
592D3	Mystic clay loam, 9 to 14 percent slopes, severely eroded	270	0.1
594C2	Galland loam, 5 to 9 percent slopes, moderately eroded	740	0.2
594D2	Galland loam, 9 to 14 percent slopes, moderately eroded	2,850	0.9
715	Nodaway-Amana silt loams, 0 to 2 percent slopes	6,350	1.9
730B	Nodaway-Cantril complex, 0 to 5 percent slopes	3,990	1.2
792C	Armstrong loam, 5 to 9 percent slopes	1,040	0.3
792C2	Armstrong loam, 5 to 9 percent slopes, moderately eroded	15,470	4.6
792C3	Armstrong clay loam, 5 to 9 percent slopes, severely eroded	210	0.1
792D	Armstrong loam, 9 to 14 percent slopes	290	0.1
792D2	Armstrong loam, 9 to 14 percent slopes, moderately eroded	8,300	2.5
792D3	Armstrong clay loam, 9 to 14 percent slopes, severely eroded	220	0.1
795D2	Ashgrove silty clay loam, 9 to 14 percent slopes, moderately eroded	250	0.1
822D2	Lamoni clay loam, 9 to 14 percent slopes, moderately eroded	1,230	0.4
831B	Pershing silt loam, benches, 2 to 5 percent slopes	920	0.3
831C2	Pershing silty clay loam, benches, 5 to 9 percent slopes, moderately eroded	1,220	0.4
832B	Weller silt loam, benches, 2 to 5 percent slopes	980	0.3
832C2	Weller silty clay loam, benches, 5 to 9 percent slopes, moderately eroded	1,240	0.4
993D2	Gara-Armstrong loams, 9 to 14 percent slopes, moderately eroded	12,080	3.6
993D3	Gara-Armstrong clay loams, 9 to 14 percent slopes, severely eroded	860	0.3
994E2	Douds-Galland loams, 14 to 18 percent slopes, moderately eroded	1,800	0.6
1130	Belinda silt loam, benches, 0 to 2 percent slopes	240	0.1
1139	Perks Variant sand, 0 to 2 percent slopes	350	0.1
1260	Beckwith silt loam, benches, 0 to 2 percent slopes	320	0.1
1715	Nodaway-Lawson-Ackmore silt loams, 0 to 2 percent slopes	11,400	3.5
1977	Richwood Variant loam, 1 to 3 percent slopes	280	0.1
5010	Pits, sand and gravel	10	*
5020	Pits and Dumps	70	*
5021	Orthents, hilly	470	0.1
5030	Pits, limestone quarries	60	*
5040	Orthents, loamy	180	0.1
	Water	390	0.1
	Total	326,400	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
13B	Olmitz-Vesser-Zook complex, 0 to 5 percent slopes (where drained and either protected from flooding or not frequently flooded during the growing season)
51	Vesser silt loam, 0 to 2 percent slopes (where drained)
51+	Vesser silt loam, overwash, 0 to 2 percent slopes (where drained)
51B	Vesser silt loam, 2 to 5 percent slopes (where drained)
51B+	Vesser silt loam, overwash, 2 to 5 percent slopes (where drained)
54	Zook silty clay loam, 0 to 2 percent slopes (where drained and either protected from flooding or not frequently flooded during the growing season)
54+	Zook silt loam, overwash, 0 to 2 percent slopes (where drained and either protected from flooding or not frequently flooded during the growing season)
56B	Cantril loam, 2 to 5 percent slopes (where drained)
80B	Clinton silt loam, 2 to 5 percent slopes
130	Belinda silt loam, 0 to 2 percent slopes (where drained)
131B	Pershing silt loam, 2 to 5 percent slopes
132B	Weller silt loam, 2 to 5 percent slopes
211	Edina silt loam, 0 to 1 percent slopes (where drained)
269	Humeston silt loam, 0 to 2 percent slopes (where drained and either protected from flooding or not frequently flooded during the growing season)
273B	Olmitz loam, 2 to 5 percent slopes
362	Haig silt loam, 0 to 2 percent slopes (where drained)
364B	Grundy silt loam, 2 to 5 percent slopes
405	Floris silt loam, 0 to 2 percent slopes (where protected from flooding or not frequently flooded during the growing season)
430	Ackmore silt loam, 0 to 2 percent slopes (where drained)
453	Tuskeego silt loam, 0 to 2 percent slopes (where drained)
484	Lawson silt loam, 0 to 2 percent slopes
520	Coppock silt loam, 0 to 2 percent slopes (where drained)
520B	Coppock silt loam, 2 to 5 percent slopes (where drained)
587	Chequest silty clay loam, 0 to 2 percent slopes (where drained)
715	Nodaway-Amana silt loams, 0 to 2 percent slopes
730B	Nodaway-Cantril complex, 0 to 5 percent slopes
831B	Pershing silt loam, benches, 2 to 5 percent slopes
832B	Weller silt loam, benches, 2 to 5 percent slopes
1130	Belinda silt loam, benches, 0 to 2 percent slopes (where drained)
1715	Nodaway-Lawson-Ackmore silt loams, 0 to 2 percent slopes (where drained)
1977	Richwood Variant loam, 1 to 3 percent slopes

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass	Bromegrass-alfalfa
		Bu	Bu	Bu	Tons	AUM*	AUM*	AUM*
13B------------- Olmitz-Vesser-Zook	IIIw	126	42	63	3.8	3.1	4.7	---
24D2------------ Shelby	IIIe	115	39	58	4.8	2.8	4.9	5.6
24E2------------ Shelby	IVe	98	33	49	4.1	2.4	4.0	4.5
51-------------- Vesser	IIw	130	44	65	3.9	3.2	5.0	5.6
51+------------- Vesser	IIw	132	44	66	4.0	3.2	5.0	5.6
51B------------- Vesser	IIw	127	43	64	3.8	3.1	4.9	5.5
51B+------------ Vesser	IIw	129	43	65	3.9	3.2	4.9	5.5
54-------------- Zook	IIw	126	42	63	3.8	3.1	4.0	---
54+------------- Zook	IIw	131	44	66	3.9	3.2	4.0	---
56B------------- Cantril	IIe	113	38	57	4.5	2.8	5.0	6.6
58D2------------ Douds	IVe	69	23	35	3.0	1.7	2.7	4.3
65E------------- Lindley	VIe	---	---	---	3.5	2.1	3.4	---
65E2------------ Lindley	VIe	---	---	---	3.4	2.0	3.3	---
65F------------- Lindley	VIIe	---	---	---	2.3	1.8	3.0	---
65F2------------ Lindley	VIIe	---	---	---	2.1	1.7	2.9	---
80B------------- Clinton	IIe	139	47	70	5.8	3.4	6.4	7.5
80C------------- Clinton	IIIe	134	45	67	5.6	3.3	6.1	7.1
80C2------------ Clinton	IIIe	130	44	65	5.5	3.2	6.0	7.0
80D2------------ Clinton	IIIe	121	41	61	5.1	3.0	5.3	6.3

See footnote at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass	Bromegrass-alfalfa
		Bu	Bu	Bu	Tons	AUM*	AUM*	AUM*
93D2------------ Adair-Shelby	IVe	91	30	46	3.6	2.2	3.5	4.3
94E2------------ Caleb-Mystic	VIe	---	---	30	2.1	1.3	2.8	2.9
130------------- Belinda	IIIw	112	38	56	3.4	2.8	5.1	6.1
131B------------ Pershing	IIIe	119	40	60	4.8	2.9	6.0	7.0
131C2----------- Pershing	IIIe	107	36	54	4.3	2.6	5.7	6.6
132B------------ Weller	IIIe	105	35	53	4.4	2.6	5.6	6.6
132C------------ Weller	IIIe	100	34	50	4.2	2.5	5.4	6.3
132C2----------- Weller	IIIe	93	31	47	3.9	2.3	5.0	5.5
179D2----------- Gara	IVe	106	36	53	4.5	2.6	4.5	5.1
179E------------ Gara	VIe	---	---	---	3.9	2.3	3.3	4.1
179E2----------- Gara	VIe	---	---	---	3.7	2.2	---	3.8
179E3----------- Gara	VIe	---	---	---	3.4	2.0	---	2.8
179F------------ Gara	VIe	---	---	---	2.4	2.0	---	2.5
179F2----------- Gara	VIIe	---	---	---	2.0	1.9	---	2.0
179F3----------- Gara	VIIe	---	---	---	1.5	1.7	---	1.8
192C2----------- Adair	IIIe	82	27	41	3.4	2.0	3.5	4.5
192D2----------- Adair	IVe	73	25	37	2.9	1.9	2.9	3.8
211------------- Edina	IIIw	107	36	54	3.2	2.6	6.5	---
222C2----------- Clarinda	IVw	72	24	36	2.2	1.8	3.3	3.6
222C3----------- Clarinda	VIe	---	---	---	1.6	1.3	2.8	2.5

See footnote at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass	Bromegrass-alfalfa
		Bu	Bu	Bu	Tons	AUM*	AUM*	AUM*
223C2----------- Rinda	IVw	63	21	32	1.9	1.5	3.3	3.5
223C3----------- Rinda	VIe	---	---	---	1.4	1.1	2.4	2.7
260------------- Beckwith	IIIw	100	34	50	3.0	2.5	4.5	5.5
261------------- Appanoose	IIIw	97	32	49	2.9	2.4	4.5	5.5
263------------- Okaw	IIIw	98	33	49	2.9	2.4	---	---
269------------- Humeston	IIIw	110	37	55	3.3	2.7	5.0	6.1
273B------------ Olmitz	IIe	137	46	69	5.8	3.4	6.0	7.0
312B------------ Seymour	IIIe	109	37	55	4.4	2.7	5.2	6.1
312B2----------- Seymour	IIIe	102	34	51	4.1	2.5	5.0	6.0
313E2----------- Gosport	VIIe	---	---	---	1.4	0.8	1.7	3.3
313G------------ Gosport	VIIe	---	---	---	---	0.6	1.0	2.5
313G2----------- Gosport	VIIe	---	---	---	---	0.4	1.0	2.0
362------------- Haig	IIw	131	44	66	3.9	3.2	6.2	7.0
364B------------ Grundy	IIe	133	45	67	5.3	3.3	8.8	---
405------------- Floris	IIw	103	35	52	4.3	2.5	4.2	6.0
423D2----------- Bucknell	IVe	64	21	32	2.7	1.6	3.5	4.1
423D3----------- Bucknell	VIe	---	---	---	1.8	1.1	3.0	3.8
424D2----------- Lindley-Keswick	IVe	73	24	37	3.1	1.8	3.2	3.5
424E2----------- Lindley-Keswick	VIe	---	---	---	2.4	1.4	2.8	3.0
425C------------ Keswick	IIIe	74	25	37	3.1	1.8	3.7	4.3

See footnote at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass	Bromegrass-alfalfa
		Bu	Bu	Bu	Tons	AUM*	AUM*	AUM*
425C2----------- Keswick	IIIe	64	21	32	2.7	1.6	3.1	3.6
425D------------ Keswick	IVe	65	22	33	2.7	1.6	3.1	3.6
425D2----------- Keswick	IVe	55	18	28	2.3	1.3	2.7	3.0
425D3----------- Keswick	VIe	---	---	---	1.5	1.0	1.7	2.0
430------------- Ackmore	IIw	141	47	71	4.2	3.5	6.3	7.5
451D2----------- Caleb	IVe	83	28	42	3.6	2.1	4.0	4.6
452C2----------- Lineville	IIIe	85	28	43	3.4	2.1	3.3	---
453------------- Tuskeego	IIIw	105	35	53	3.2	2.6	4.3	5.5
484------------- Lawson	IIw	157	53	79	6.3	3.9	---	---
520------------- Coppock	IIw	121	41	61	3.6	3.0	4.7	6.1
520B------------ Coppock	IIw	118	40	59	3.5	2.9	4.3	6.0
531B------------ Kniffin	IIIe	99	33	50	4.0	2.4	4.9	5.8
531C------------ Kniffin	IIIe	94	31	47	3.8	2.3	4.6	5.5
531C2----------- Kniffin	IIIe	87	29	44	3.5	2.1	4.3	5.3
532B------------ Rathbun	IIIe	87	29	44	3.5	2.1	4.5	5.3
532C------------ Rathbun	IIIe	82	27	41	3.2	2.0	4.1	5.0
532C2----------- Rathbun	IIIe	75	25	38	3.0	1.8	3.9	4.6
587------------- Chequest	IIw	120	40	60	3.6	3.0	5.3	6.5
592C2----------- Mystic	IIIe	65	22	33	2.6	1.6	2.9	3.9
592D2----------- Mystic	IVe	56	19	28	2.3	1.4	2.3	3.3

See footnote at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass	Bromegrass-alfalfa
		Bu	Bu	Bu	Tons	AUM*	AUM*	AUM*
592D3----------- Mystic	VIe	---	---	18	1.4	0.9	1.7	2.5
594C2----------- Galland	IIIe	60	20	30	2.4	1.5	3.1	3.8
594D2----------- Galland	IVe	51	17	26	2.0	1.3	2.7	3.0
715------------- Nodaway-Amana	IIw	149	50	74	5.9	3.6	6.5	7.6
730B------------ Nodaway-Cantril	IIIw	126	42	63	5.0	3.1	6.1	7.3
792C------------ Armstrong	IIIe	83	28	42	3.3	2.0	3.3	4.5
792C2----------- Armstrong	IIIe	73	24	37	2.9	1.8	3.1	4.1
792C3----------- Armstrong	IVe	53	18	27	2.1	1.3	2.7	3.3
792D------------ Armstrong	IVe	74	25	37	2.9	1.8	3.1	3.8
792D2----------- Armstrong	IVe	64	21	32	2.7	1.7	---	3.3
792D3----------- Armstrong	VIe	---	---	---	1.8	1.1	1.7	2.3
795D2----------- Ashgrove	IVe	45	15	24	1.4	1.1	1.7	3.0
822D2----------- Lamoni	IVe	73	24	37	3.0	1.8	3.7	4.3
831B------------ Pershing	IIIe	119	40	60	4.8	2.9	6.0	7.0
831C2----------- Pershing	IIIe	107	36	54	4.3	2.6	5.4	6.3
832B------------ Weller	IIIe	105	35	53	4.4	2.6	5.6	6.6
832C2----------- Weller	IIIe	93	31	47	3.9	2.3	5.0	5.5
993D2----------- Gara-Armstrong	IVe	82	27	41	3.3	2.0	---	4.5
993D3----------- Gara-Armstrong	VIe	---	---	---	2.5	1.5	---	3.9
994E2----------- Douds-Galland	VIe	---	---	---	1.7	1.8	2.4	2.3

See footnote at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Oats	Bromegrass-alfalfa hay	Kentucky bluegrass	Smooth bromegrass	Bromegrass-alfalfa
		Bu	Bu	Bu	Tons	AUM*	AUM*	AUM*
1130------------ Belinda	IIIw	112	38	56	3.4	2.8	5.1	6.1
1139------------ Perks Variant	IIIs	80	27	40	3.4	2.1	3.2	5.1
1260------------ Beckwith	IIIw	100	34	50	2.5	2.5	4.5	5.5
1715------------ Nodaway-Lawson-Ackmore	IIIw	140	47	70	5.6	4.1	6.3	7.5
1977------------ Richwood Variant	I	146	49	73	6.1	4.5	6.3	7.3
5010, 5020. Pits								
5021. Orthents								
5030. Pits								
5040. Orthents								

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
56B------------- Cantril	4A	Slight	Slight	Slight	Slight	White oak-----------	75	57	Eastern white pine, red pine, white spruce, sugar maple.
58D2------------ Douds	3A	Slight	Slight	Slight	Slight	White oak----------- Northern red oak----	55 55	38 38	Eastern white pine, red pine, Norway spruce, Scotch pine, European larch, white spruce, sugar maple.
65E, 65E2, 65F, 65F2----------- Lindley	3R	Moderate	Moderate	Slight	Slight	White oak----------- Post oak------------ Blackjack oak------- Black oak----------- White oak----------- Post oak------------	60 --- --- --- --- ---	43 --- --- --- --- ---	White oak, green ash, black oak, northern red oak.
80B, 80C, 80C2, 80D2----------- Clinton	3A	Slight	Slight	Slight	Slight	White oak----------- Northern red oak----	65 65	48 48	Eastern white pine, red pine, black walnut, white oak, European larch, northern red oak.
94E2: Caleb----------	3R	Moderate	Moderate	Slight	Slight	White oak----------- Northern red oak----	55 55	38 38	Eastern white pine, red pine, black walnut, sugar maple.
Mystic---------	3R	Slight	Moderate	Slight	Slight	White oak----------- Northern red oak----	55 55	38 38	Eastern white pine, red pine, black walnut, sugar maple.
130------------- Belinda	2W	Slight	Severe	Moderate	Moderate	White oak-----------	45	30	Eastern cottonwood, silver maple, golden willow, American sycamore, green ash, northern whitecedar.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
131B, 131C2----- Pershing	3C	Slight	Slight	Severe	Severe	White oak-----------	55	38	Eastern white pine, white oak, red pine.
132B, 132C, 132C2---------- Weller	3C	Slight	Slight	Severe	Severe	White oak-----------	55	38	Eastern white pine, red pine, black walnut, sugar maple.
179D2----------- Gara	3A	Slight	Slight	Slight	Slight	White oak----------- Northern red oak----	55 55	38 38	Eastern white pine, red pine, white oak, northern red oak.
179E, 179E2----- Gara	3R	Moderate	Moderate	Slight	Slight	White oak----------- Northern red oak----	55 55	38 38	Eastern white pine, red pine, white oak, northern red oak.
179E3----------- Gara	3R	Moderate	Moderate	Slight	Slight	White oak----------- Northern red oak----	55 55	38 38	Eastern white pine, red pine, white oak.
179F, 179F2----- Gara	3R	Moderate	Moderate	Slight	Slight	White oak----------- Northern red oak----	55 55	38 38	Eastern white pine, red pine, white oak, northern red oak.
179F3----------- Gara	3R	Moderate	Moderate	Slight	Slight	White oak----------- Northern red oak----	55 55	38 38	Eastern white pine, red pine, white oak.
223C2, 223C3---- Rinda	2W	Slight	Severe	Moderate	Moderate	White oak----------- Northern red oak----	45 45	30 30	Silver maple, American sycamore, green ash, hackberry, eastern redcedar, white spruce, Norway spruce.
260------------- Beckwith	2W	Slight	Severe	Moderate	Moderate	White oak-----------	45	30	Eastern cottonwood, silver maple, American sycamore, green ash.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
261: Appanoose	2W	Slight	Moderate	Moderate	Moderate	White oak	45	30	Eastern cottonwood, silver maple, laurel willow, American sycamore, green ash, northern whitecedar.
263: Okaw	4W	Slight	Severe	Severe	Severe	Pin oak	70	52	Pin oak, baldcypress, green ash, water tupelo, red maple, swamp white oak.
						Blackjack oak	60	43	
						Black oak	55	38	
						White oak	---	---	
313E2: Gosport	2C	Slight	Slight	Severe	Severe	White oak	45	30	Eastern white pine, red pine, Norway spruce, Scotch pine, white spruce, cottonwood.
313G, 313G2: Gosport	2R	Moderate	Moderate	Severe	Severe	White oak	45	30	Eastern white pine, red pine, Norway spruce, Scotch pine, white spruce, cottonwood.
405: Floris	3A	Slight	Slight	Slight	Slight	White oak	63	46	White oak, eastern cottonwood, eastern white pine, red pine, Scotch pine.
						Eastern cottonwood	105	141	
423D2, 423D3: Bucknell	2C	Slight	Slight	Slight	Moderate	White oak	50	34	Silver maple, American sycamore, green ash, hackberry, eastern redcedar.
						Northern red oak	50	34	
424D2:									
Lindley	3A	Slight	Slight	Slight	Slight	White oak	60	43	White oak, green ash, black oak, northern red oak.
						Post oak	---	---	
						Blackjack oak	---	---	
						Black oak	---	---	
						White oak	---	---	
						Post oak	---	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
424D2: Keswick	3C	Slight	Slight	Moderate	Severe	White oak Northern red oak	55 55	38 38	Eastern white pine, red pine, sugar maple.
424E2: Lindley	3R	Moderate	Moderate	Slight	Slight	White oak Post oak Blackjack oak Black oak White oak Post oak	60 --- --- --- --- ---	43 --- --- --- --- ---	White oak, green ash, black oak, northern red oak.
Keswick	3R	Moderate	Moderate	Moderate	Severe	White oak Northern red oak	55 55	38 38	Eastern white pine, red pine, sugar maple.
425C, 425C2, 425D, 425D2, 425D3 Keswick	3C	Slight	Slight	Moderate	Severe	White oak Northern red oak	55 55	38 38	Eastern white pine, red pine, sugar maple.
430 Ackmore	3A	Slight	Slight	Slight	Slight	White oak	65	48	Eastern white pine, red pine, cottonwood, sugar maple, black walnut.
451D2 Caleb	3A	Slight	Slight	Slight	Slight	White oak Northern red oak	55 55	38 38	Eastern white pine, red pine, black walnut, sugar maple.
452C2 Lineville	3A	Slight	Slight	Slight	Slight	White oak	55	38	Eastern white pine, red pine, Norway spruce, white spruce, sugar maple.
453 Tuskeego	2W	Slight	Severe	Moderate	Moderate	Silver maple Eastern cottonwood	80 90	34 103	Eastern cottonwood, silver maple, laurel willow, American sycamore, green ash, northern whitecedar.
484 Lawson	2A	Slight	Slight	Slight	Slight	Silver maple White ash Red maple	70 --- ---	25 --- ---	White spruce, silver maple, white ash.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
520, 520B: Coppock	3A	Slight	Slight	Slight	Slight	White oak Northern red oak	65 65	48 48	Eastern white pine, red pine, sugar maple.
531B, 531C, 531C2: Kniffin	3C	Slight	Moderate	Moderate	Slight	White oak	55	38	Eastern white pine, red pine, black walnut, sugar maple.
532B, 532C, 532C2: Rathbun	3C	Slight	Slight	Moderate	Moderate	White oak	55	38	Eastern white pine, red pine, black walnut.
587: Chequest	2W	Slight	Severe	Moderate	Moderate	Silver maple Eastern cottonwood	80 90	34 103	Eastern cottonwood, silver maple, laurel willow, American sycamore, green ash, northern whitecedar.
592C2, 592D2, 592D3: Mystic	3A	Slight	Slight	Slight	Slight	White oak Northern red oak	55 55	38 38	Eastern white pine, red pine, black walnut, sugar maple.
594C2, 594D2: Galland	3C	Slight	Slight	Severe	Severe	White oak Northern red oak	65 70	48 52	Eastern white pine, red pine, black walnut, sugar maple.
715:									
Nodaway	3A	Slight	Slight	Slight	Slight	White oak	65	48	Eastern white pine, red pine, black walnut, sugar maple, European larch.
Amana	3A	Slight	Slight	Slight	Slight	White oak Northern red oak	62 58	45 41	Eastern white pine, red pine, black walnut, sugar maple.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
730B:									
Nodaway	3A	Slight	Slight	Slight	Slight	White oak	65	48	Eastern white pine, red pine, black walnut, sugar maple, European larch.
Cantril	4A	Slight	Slight	Slight	Slight	White oak	75	57	Eastern white pine, red pine, white spruce, sugar maple.
792C, 792C2, 792C3, 792D, 792D2, 792D3 Armstrong	3C	Slight	Slight	Moderate	Severe	White oak Northern red oak	55 55	38 38	Eastern white pine, red pine, European larch, sugar maple.
795D2 Ashgrove	2W	Slight	Severe	Moderate	Moderate	White oak Northern red oak	45 45	30 30	Silver maple, American sycamore, green ash, hackberry.
831B, 831C2 Pershing	3C	Slight	Slight	Severe	Severe	White oak	55	38	Eastern white pine, white oak, red pine.
832B, 832C2 Weller	3C	Slight	Slight	Severe	Severe	White oak	55	38	Eastern white pine, red pine, black walnut, sugar maple.
993D2:									
Gara	3A	Slight	Slight	Slight	Slight	White oak Northern red oak	55 55	38 38	Eastern white pine, red pine, white oak, northern red oak.
Armstrong	3C	Slight	Slight	Moderate	Severe	White oak Northern red oak	55 55	38 38	Eastern white pine, red pine, European larch, sugar maple.
993D3:									
Gara	3A	Slight	Slight	Slight	Slight	White oak Northern red oak	55 55	38 38	Eastern white pine, red pine, white oak.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
993D3:									
Armstrong	3C	Slight	Slight	Moderate	Severe	White oak Northern red oak	55 55	38 38	Eastern white pine, European larch, sugar maple.
994E2:									
Douds	3R	Moderate	Moderate	Slight	Slight	White oak Northern red oak	55 55	38 38	Eastern white pine, red pine, Norway spruce, Scotch pine, European larch, white spruce, sugar maple.
Galland	3R	Moderate	Moderate	Severe	Severe	White oak Northern red oak	65 70	48 52	Eastern white pine, red pine, black walnut, sugar maple.
1130 Belinda	2W	Slight	Severe	Moderate	Moderate	White oak	45	30	Eastern cottonwood, silver maple, golden willow, American sycamore, green ash, northern whitecedar.
1139 Perks Variant	3S	Slight	Slight	Moderate	Slight	White oak	60	43	Eastern white pine, Scotch pine, European larch, eastern redcedar.
1260 Beckwith	2W	Slight	Severe	Moderate	Moderate	White oak	45	30	Eastern cottonwood, silver maple, American sycamore, green ash.
1715:									
Nodaway	3A	Slight	Slight	Slight	Slight	White oak	65	48	Eastern white pine, red pine, black walnut, sugar maple, European larch.
Lawson	2A	Slight	Slight	Slight	Slight	Silver maple White ash Red maple	70 --- ---	25 --- ---	White spruce, silver maple, white ash.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
1715:									
Ackmore	3A	Slight	Slight	Slight	Slight	White oak	65	48	Eastern white pine, red pine, cottonwood, sugar maple, black walnut.

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
13B:					
Olmitz	---	Amur honeysuckle, Amur privet, silky dogwood, American cranberrybush.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Austrian pine, Norway spruce.	Pin oak, eastern white pine.
Vesser	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Zook	---	Silky dogwood, Amur honeysuckle, American cranberrybush, Amur privet.	Norway spruce, northern whitecedar, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
24D2, 24E2 Shelby	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern whitecedar, blue spruce, white fir.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
51, 51+, 51B, 51B+ Vesser	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
54, 54+ Zook	---	Silky dogwood, Amur honeysuckle, American cranberrybush, Amur privet.	Norway spruce, northern whitecedar, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
56B Cantril	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern whitecedar, blue spruce, white fir, Austrian pine.	Norway spruce	Pin oak, eastern white pine.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
58D2: Douds	---	Silky dogwood, Amur privet, American cranberrybush, Amur honeysuckle.	Blue spruce, white fir, northern whitecedar, Washington hawthorn.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
65E, 65E2, 65F, 65F2: Lindley	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Northern whitecedar, Washington hawthorn, blue spruce, white fir.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
80B, 80C, 80C2, 80D2: Clinton	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
93D2:					
Adair	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osageorange.	Eastern white pine, pin oak.	---
Shelby	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern whitecedar, blue spruce, white fir.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
94E2:					
Caleb	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Mystic	---	American cranberrybush, Amur honeysuckle, eastern redcedar, arrowwood, Amur privet, Washington hawthorn.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	---

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
130. Belinda	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Austrian pine, Norway spruce, blue spruce, northern whitecedar, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
131B, 131C2. Pershing	---	Eastern redcedar, Washington hawthorne, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Austrian pine, Osageorange, green ash.	Eastern white pine, pin oak.	---
132B, 132C, 132C2. Weller	---	American cranberrybush, Amur honeysuckle, arrowwood, Washington hawthorn, Amur privet, eastern redcedar.	Osageorange, green ash, Austrian pine.	Eastern white pine, pin oak.	---
179D2, 179E, 179E2, 179E3, 179F, 179F2, 179F3. Gara	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Northern whitecedar, white fir, Washington hawthorn, blue spruce.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
192C2, 192D2. Adair	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osageorange.	Eastern white pine, pin oak.	---
211. Edina	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, blue spruce, northern whitecedar, white fir, Washington hawthorn.	Eastern white pine	Pin oak.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
222C2, 222C3------ Clarinda	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Green ash, Osageorange.	Eastern white pine, pin oak, Austrian pine.	---
223C2, 223C3------ Rinda	---	American cranberrybush, eastern redcedar, Washington hawthorn, arrowwood, Amur honeysuckle, Amur privet.	Green ash, Austrian pine, Osageorange.	Eastern white pine, pin oak.	---
260--------------- Beckwith	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
261--------------- Appanoose	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
263--------------- Okaw	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
269--------------- Humeston	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
273B-------------- Olmitz	---	Amur honeysuckle, Amur privet, silky dogwood, American cranberrybush.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Austrian pine, Norway spruce.	Pin oak, eastern white pine.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
312B, 312B2: Seymour	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osageorange.	Eastern white pine, pin oak.	---
313E2, 313G, 313G2: Gosport	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osageorange.	Eastern white pine, pin oak.	---
362: Haig	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, blue spruce, white fir, northern whitecedar, Washington hawthorn.	Eastern white pine	Pin oak.
364B: Grundy	---	Washington hawthorn, eastern redcedar, Amur honeysuckle, Amur privet, American cranberrybush, arrowwood.	Austrian pine, Osageorange, green ash.	Pin oak, eastern white pine.	---
405: Floris	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	---	Pin oak, eastern white pine.
423D2, 423D3: Bucknell	---	American cranberrybush, eastern redcedar, arrowwood, Washington hawthorn, Amur privet, Amur honeysuckle.	Green ash, Austrian pine, Osageorange.	Eastern white pine, pin oak.	---

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
424D2, 424E2:					
Lindley	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Northern whitecedar, Washington hawthorn, blue spruce, white fir.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
Keswick	---	Eastern redcedar, American cranberrybush, Washington hawthorn, arrowwood, Amur privet, Amur honeysuckle.	Austrian pine, green ash, Osageorange.	Eastern white pine, pin oak.	---
425C, 425C2, 425D, 425D2, 425D3 Keswick	---	Eastern redcedar, American cranberrybush, Washington hawthorn, arrowwood, Amur privet, Amur honeysuckle.	Austrian pine, green ash, Osageorange.	Eastern white pine, pin oak.	---
430 Ackmore	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
451D2 Caleb	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
452C2 Lineville	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, Osageorange, green ash.	Eastern white pine, pin oak.	---
453 Tuskeego	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
484. Lawson	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
520, 520B. Coppock	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Austrian pine, northern whitecedar, white fir, blue spruce, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
531B, 531C, 531C2. Kniffin	---	American cranberrybush, Amur honeysuckle, eastern redcedar, Washington hawthorn, Amur privet, arrowwood.	Austrian pine, green ash, Osageorange.	Pin oak, eastern white pine.	---
532B, 532C, 532C2. Rathbun	---	American cranberrybush, eastern redcedar, Amur honeysuckle, Washington hawthorn, arrowwood, Amur privet.	Osageorange, Austrian pine, green ash.	Pin oak, eastern white pine.	---
587. Chequest	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
592C2, 592D2, 592D3. Mystic	---	American cranberrybush, Amur honeysuckle, eastern redcedar, arrowwood, Amur privet, Washington hawthorn.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	---
594C2, 594D2. Galland	---	Eastern redcedar, American cranberrybush, Washington hawthorn, arrowwood, Amur privet, Amur honeysuckle.	Austrian pine, green ash, Osageorange.	Eastern white pine, pin oak.	---

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
715:					
Nodaway	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Amana	---	Silky dogwood, Amur privet, American cranberrybush.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Pin oak, eastern white pine.
730B:					
Nodaway	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Cantril	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern whitecedar, blue spruce, white fir, Austrian pine.	Norway spruce	Pin oak, eastern white pine.
792C, 792C2, 792C3, 792D, 792D2, 792D3 Armstrong	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, American cranberrybush, Amur honeysuckle.	Austrian pine, green ash, Osageorange.	Eastern white pine, pin oak.	---
795D2 Ashgrove	---	Eastern redcedar, American cranberrybush, Washington hawthorn, arrowwood, Amur privet, Amur honeysuckle.	Austrian pine, green ash, Osageorange.	Eastern white pine, pin oak.	---
822D2 Lamoni	---	Eastern redcedar, Washington hawthorn, arrowwood, Amur honeysuckle, Amur privet, American cranberrybush.	Austrian pine, green ash, Osageorange.	Eastern white pine, pin oak.	---

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
831B, 831C2 Pershing	---	Eastern redcedar, Washington hawthorn, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Austrian pine, Osageorange, green ash.	Eastern white pine, pin oak.	---
832B, 832C2 Weller	---	American cranberrybush, Amur honeysuckle, arrowwood, Washington hawthorn, Amur privet, eastern redcedar.	Osageorange, green ash, Austrian pine.	Eastern white pine, pin oak.	---
993D2, 993D3:					
Gara	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Northern whitecedar, white fir, Washington hawthorn, blue spruce.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
Armstrong	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, American cranberrybush, Amur honeysuckle.	Austrian pine, green ash, Osageorange.	Eastern white pine, pin oak.	---
994E2:					
Douds	---	Silky dogwood, Amur privet, American cranberrybush, Amur honeysuckle.	Blue spruce, white fir, northern whitecedar, Washington hawthorn.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
Galland	---	Eastern redcedar, American cranberrybush, Washington hawthorn, arrowwood, Amur privet, Amur honeysuckle.	Austrian pine, green ash, Osageorange.	Eastern white pine, pin oak.	---
1130 Belinda	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Austrian pine, Norway spruce, blue spruce, northern whitecedar, white fir, Washington hawthorn.	Eastern white pine	Pin oak.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1139. Perks Variant	Siberian peashrub, indiancurrant coralberry, gray dogwood.	Russian olive, eastern redcedar.	Hackberry, Scotch pine.	---	---
1260. Beckwith	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
1715:					
Nodaway	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Lawson	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Ackmore	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
1977. Richwood Variant	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Blue spruce, white fir, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
5010, 5020. Pits					
5021. Orthents					
5030. Pits					
5040. Orthents					

TABLE 9.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
13B: Olmitz	Slight	Slight	Moderate: slope.	Slight	Slight.
Vesser	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Zook	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
24D2 Shelby	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
24E2 Shelby	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
51, 51+ Vesser	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
51B, 51B+ Vesser	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
54, 54+ Zook	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
56B Cantril	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
58D2 Douds	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
65E, 65E2 Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
65F, 65F2 Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
80B Clinton	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
80C, 80C2 Clinton	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight	Slight.
80D2 Clinton	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
93D2:					
Adair	Severe: wetness.	Moderate: wetness, slope, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: slope, wetness.
Shelby	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
94E2:					
Caleb	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Mystic	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
130 Belinda	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
131B Pershing	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.
131C2 Pershing	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Slight	Slight.
132B Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.
132C, 132C2 Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Slight	Slight.
179D2 Gara	Moderate: percs slowly, slope.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
179E, 179E2, 179E3, 179F, 179F2, 179F3 Gara	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
192C2 Adair	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness.
192D2 Adair	Severe: wetness.	Moderate: wetness, slope, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: slope, wetness.
211 Edina	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
222C2, 222C3----------Clarinda	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness.
223C2, 223C3----------Rinda	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness.
260------------------Beckwith	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
261------------------Appanoose	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
263------------------Okaw	Severe: flooding, ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
269------------------Humeston	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
273B-----------------Olmitz	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
312B, 312B2----------Seymour	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight----------	Slight.
313E2----------------Gosport	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope, thin layer, area reclaim.
313G, 313G2----------Gosport	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, erodes easily.	Severe: slope.
362------------------Haig	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
364B-----------------Grundy	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
405------------------Floris	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
423D2, 423D3---------Bucknell	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness, slope.
424D2:					
Lindley---------------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
424D2:					
Keswick	Severe: wetness.	Moderate: slope, wetness.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.
424E2:					
Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Keswick	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: erodes easily.	Severe: slope.
425C, 425C2 Keswick	Severe: wetness.	Moderate: wetness.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness.
425D, 425D2, 425D3 Keswick	Severe: wetness.	Moderate: slope, wetness.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.
430 Ackmore	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
451D2 Caleb	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
452C2 Lineville	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness.
453 Tuskeego	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
484 Lawson	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
520 Coppock	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
520B Coppock	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
531B Kniffin	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.
531C, 531C2 Kniffin	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Slight	Slight.
532B Rathbun	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
532C, 532C2: Rathbun	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Slight	Slight.
587: Chequest	Severe: wetness, flooding.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
592C2: Mystic	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight	Slight.
592D2, 592D3: Mystic	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
594C2: Galland	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight	Slight.
594D2: Galland	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
715:					
Nodaway	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Amana	Severe: flooding.	Moderate: wetness.	Moderate: flooding, wetness.	Slight	Moderate: flooding.
730B:					
Nodaway	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Cantril	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
792C, 792C2, 792C3: Armstrong	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness.
792D, 792D2, 792D3: Armstrong	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: slope, wetness.
795D2: Ashgrove	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, slope.
822D2: Lamoni	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness, slope.
831B: Pershing	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
831C2----------------- Pershing	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Slight----------	Slight.
832B------------------ Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight----------	Slight.
832C2----------------- Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Slight----------	Slight.
993D2:					
Gara-----------------	Moderate: percs slowly, slope.	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.
Armstrong------------	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: slope, wetness.
993D3:					
Gara-----------------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.
Armstrong------------	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: slope, wetness.
994E2:					
Douds----------------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Galland--------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
1130------------------ Belinda	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
1139------------------ Perks Variant	Severe: flooding, too sandy.	Severe: too sandy.	Severe: too sandy, flooding.	Severe: too sandy.	Severe: flooding.
1260------------------ Beckwith	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
1715:					
Nodaway--------------	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: flooding.
Lawson---------------	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1715:					
Ackmore	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
1977 Richwood Variant	Slight	Slight	Moderate: slope.	Slight	Slight.
5010, 5020. Pits					
5021. Orthents					
5030. Pits					
5040. Orthents					

TABLE 10.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
13B:										
Olmitz	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
Vesser	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Zook	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
24D2 Shelby	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
24E2 Shelby	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
51, 51+, 51B, 51B+ Vesser	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
54, 54+ Zook	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
56B Cantril	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
58D2 Douds	Fair	Good	Fair	Good	Fair	Poor	Poor	Fair	Good	Poor.
65E, 65E2 Lindley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
65F, 65F2 Lindley	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
80B Clinton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
80C, 80C2, 80D2 Clinton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
93D2:										
Adair	Fair	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
Shelby	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
94E2:										
Caleb	Poor	Good	Fair	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.
Mystic	Poor	Fair	Fair	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
130 Belinda	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
131B Pershing	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
131C2: Pershing	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
132B: Weller	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
132C, 132C2: Weller	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
179D2: Gara	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Poor.
179E, 179E2, 179E3, 179F, 179F2, 179F3: Gara	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
192C2, 192D2: Adair	Fair	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
211: Edina	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
222C2, 222C3: Clarinda	Poor	Fair	Poor	Fair	Poor	Poor	Poor	Fair	Fair	Poor.
223C2, 223C3: Rinda	Poor	Fair	Poor	Fair	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.
260: Beckwith	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
261: Appanoose	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
263: Okaw	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
269: Humeston	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
273B: Olmitz	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
312B, 312B2: Seymour	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
313E2, 313G, 313G2: Gosport	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
362: Haig	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
364B: Grundy	Fair	Good	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
405: Floris	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
423D2, 423D3------- Bucknell	Fair	Good	Fair	Good	Fair	Poor	Poor	Fair	Good	Very poor.
424D2:										
Lindley-----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Keswick-----------	Fair	Good	Fair	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.
424E2:										
Lindley-----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Keswick-----------	Poor	Fair	Fair	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
425C, 425C2, 425D, 425D2, 425D3------ Keswick	Fair	Good	Fair	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.
430---------------- Ackmore	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
451D2-------------- Caleb	Fair	Good	Fair	Good	Fair	Poor	Poor	Fair	Good	Poor.
452C2-------------- Lineville	Fair	Good	Fair	Good	Fair	Poor	Poor	Fair	Good	Poor.
453---------------- Tuskeego	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
484---------------- Lawson	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
520, 520B---------- Coppock	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
531B--------------- Kniffin	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
531C, 531C2-------- Kniffin	Fair	Good	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
532B--------------- Rathbun	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
532C, 532C2-------- Rathbun	Fair	Good	Fair	Fair	Fair	Poor	Poor	Fair	Fair	Poor.
587---------------- Chequest	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
592C2, 592D2, 592D3------------- Mystic	Fair	Good	Fair	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.
594C2, 594D2------- Galland	Fair	Good	Fair	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
715:										
Nodaway	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Good	Fair.
Amana	Good	Good	Good	Good	Fair	Good	Good	Good	Good	Good.
730B:										
Nodaway	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Good	Fair.
Cantril	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
792C, 792C2, 792C3, 792D, 792D2, 792D3 Armstrong	Fair	Good	Fair	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
795D2 Ashgrove	Poor	Fair	Poor	Fair	Poor	Poor	Poor	Fair	Fair	Poor.
822D2 Lamoni	Fair	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
831B Pershing	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
831C2 Pershing	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
832B Weller	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
832C2 Weller	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
993D2, 993D3:										
Gara	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Poor.
Armstrong	Fair	Good	Fair	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
994E2:										
Douds	Very poor.	Good	Fair	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.
Galland	Poor	Fair	Fair	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
1130 Belinda	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
1139 Perks Variant	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
1260 Beckwith	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
1715:										
Nodaway	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Good	Fair.
Lawson	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
1715: Ackmore	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
1977 Richwood Variant	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
5010, 5020. Pits										
5021. Orthents										
5030. Pits										
5040. Orthents										

TABLE 11.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
13B:						
Olmitz	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Vesser	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, frost action.	Moderate: wetness.
Zook	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness, flooding.
24D2 Shelby	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
24E2 Shelby	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
51, 51+ Vesser	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
51B, 51B+ Vesser	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, frost action.	Moderate: wetness.
54, 54+ Zook	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
56B Cantril	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness.	Severe: low strength, frost action.	Slight.
58D2 Douds	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: low strength, slope, shrink-swell.	Moderate: slope.
65E, 65E2, 65F, 65F2 Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
80B Clinton	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
80C, 80C2 Clinton	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
80D2: Clinton	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
93D2:						
Adair	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: wetness.	Severe: shrink-swell, wetness, slope.	Severe: shrink-swell, low strength.	Moderate: slope, wetness.
Shelby	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
94E2:						
Caleb	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Mystic	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
130: Belinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
131B, 131C2: Pershing	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, wetness.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
132B, 132C, 132C2: Weller	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, wetness.	Severe: shrink-swell.	Severe: shrink-swell, frost action, low strength.	Slight.
179D2: Gara	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
179E, 179E2, 179E3, 179F, 179F2, 179F3: Gara	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
192C2: Adair	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, low strength.	Moderate: wetness.
192D2: Adair	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: wetness.	Severe: shrink-swell, wetness, slope.	Severe: shrink-swell, low strength.	Moderate: slope, wetness.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
211----------------- Edina	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
222C2, 222C3------ Clarinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
223C2, 223C3------ Rinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
260----------------- Beckwith	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding.
261----------------- Appanoose	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
263----------------- Okaw	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
269----------------- Humeston	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, wetness, low strength.	Severe: wetness.
273B--------------- Olmitz	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
312B, 312B2------- Seymour	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
313E2------------- Gosport	Severe: too clayey, slope.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, shrink-swell.	Severe: slope, low strength, shrink-swell.	Severe: slope, area reclaim.
313G, 313G2------- Gosport	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
362----------------- Haig	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
364B--------------- Grundy	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
405: Floris	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
423D2, 423D3: Bucknell	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
424D2:						
Lindley	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Keswick	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
424E2:						
Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Keswick	Severe: wetness, slope.	Severe: wetness, shrink-swell, slope.	Severe: wetness, slope.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
425C, 425C2: Keswick	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness.
425D, 425D2, 425D3: Keswick	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
430: Ackmore	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
451D2: Caleb	Moderate: wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
452C2: Lineville	Severe: wetness.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
453: Tuskeego	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
484: Lawson	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
520----------------- Coppock	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, low strength, frost action.	Moderate: wetness, flooding.
520B---------------- Coppock	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, frost action.	Moderate: wetness.
531B, 531C, 531C2- Kniffin	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
532B, 532C, 532C2- Rathbun	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
587----------------- Chequest	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, low strength, shrink-swell.	Moderate: wetness, flooding.
592C2--------------- Mystic	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
592D2, 592D3------ Mystic	Moderate: too clayey, wetness, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
594C2--------------- Galland	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
594D2--------------- Galland	Moderate: too clayey, wetness, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope.
715: Nodaway------------	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action, low strength.	Moderate: flooding.
Amana--------------	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, low strength, frost action.	Moderate: flooding.
730B: Nodaway------------	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action, low strength.	Moderate: flooding.
Cantril------------	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness.	Severe: low strength, frost action.	Slight.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
792C, 792C2, 792C3: Armstrong	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, wetness.	Severe: shrink-swell, low strength.	Moderate: wetness.
792D, 792D2, 792D3: Armstrong	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, wetness, slope.	Severe: shrink-swell, low strength.	Moderate: slope, wetness.
795D2: Ashgrove	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness, slope.
822D2: Lamoni	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
831B, 831C2: Pershing	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, wetness.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
832B, 832C2: Weller	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, wetness.	Severe: shrink-swell.	Severe: shrink-swell, frost action, low strength.	Slight.
993D2:						
Gara	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Armstrong	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, wetness, slope.	Severe: shrink-swell, low strength.	Moderate: slope, wetness.
993D3:						
Gara	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Armstrong	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, wetness, slope.	Severe: shrink-swell, low strength.	Moderate: slope, wetness.
994E2:						
Douds	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Galland	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1130------------- Belinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
1139------------- Perks Variant	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
1260------------- Beckwith	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding.
1715:						
Nodaway----------	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action, low strength.	Moderate: flooding.
Lawson-----------	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
Ackmore----------	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
1977------------- Richwood Variant	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
5010, 5020. Pits						
5021. Orthents						
5030. Pits						
5040. Orthents						

TABLE 12.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
13B:					
Olmitz	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Vesser	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Zook	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
24D2 Shelby	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Fair: too clayey, slope.
24E2 Shelby	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
51, 51+ Vesser	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
51B, 51B+ Vesser	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
54, 54+ Zook	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
56B Cantril	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
58D2 Douds	Moderate: wetness, percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, wetness.	Severe: seepage.	Fair: too clayey, too sandy, slope.
65E, 65E2, 65F, 65F2 Lindley	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
80B Clinton	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
80C, 80C2 Clinton	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
80D2 Clinton	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
93D2:					
Adair	Severe: percs slowly, wetness.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Shelby	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Fair: too clayey, slope.
94E2:					
Caleb	Severe: wetness, slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope.	Poor: slope.
Mystic	Severe: wetness, percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
130 Belinda	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
131B Pershing	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
131C2 Pershing	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
132B Weller	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
132C, 132C2 Weller	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
179D2 Gara	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Fair: too clayey, slope.
179E, 179E2, 179E3, 179F, 179F2, 179F3 Gara	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
192C2, 192D2 Adair	Severe: percs slowly, wetness.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
211 Edina	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
222C2, 222C3: Clarinda	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
223C2, 223C3: Rinda	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
260: Beckwith	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
261: Appanoose	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
263: Okaw	Severe: ponding, percs slowly.	Slight	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
269: Humeston	Severe: wetness, percs slowly, flooding.	Severe: flooding.	Severe: wetness, too clayey, flooding.	Severe: wetness, flooding.	Poor: wetness, too clayey, hard to pack.
273B: Olmitz	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
312B, 312B2: Seymour	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
313E2: Gosport	Severe: thin layer, seepage, percs slowly.	Severe: seepage, slope.	Severe: seepage, too clayey.	Moderate: seepage, slope.	Poor: area reclaim, hard to pack.
313G, 313G2: Gosport	Severe: thin layer, seepage, percs slowly.	Severe: seepage, slope.	Severe: seepage, slope, too clayey.	Severe: slope.	Poor: area reclaim, hard to pack, slope.
362: Haig	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
364B: Grundy	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
405: Floris	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, seepage, wetness.	Fair: too clayey, wetness.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
423D2, 423D3: Bucknell	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
424D2:					
Lindley	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Keswick	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
424E2:					
Lindley	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Keswick	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: wetness, slope.	Severe: wetness, slope.	Poor: slope, wetness.
425C, 425C2, 425D, 425D2, 425D3: Keswick	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
430: Ackmore	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness, hard to pack.
451D2: Caleb	Severe: wetness.	Severe: slope, wetness.	Moderate: wetness, slope, too clayey.	Moderate: slope.	Fair: too clayey, slope, wetness.
452C2: Lineville	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
453: Tuskeego	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
484: Lawson	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
520: Coppock	Severe: wetness, flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
520B: Coppock	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
531B: Kniffin	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: hard to pack.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
531C, 531C2 Kniffin	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: hard to pack.
532B Rathbun	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: hard to pack.
532C, 532C2 Rathbun	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: hard to pack.
587 Chequest	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: wetness, hard to pack, too clayey.
592C2 Mystic	Severe: wetness, percs slowly.	Severe: seepage, slope.	Severe: seepage, too clayey.	Slight	Poor: too clayey, hard to pack.
592D2, 592D3 Mystic	Severe: wetness, percs slowly.	Severe: seepage, slope.	Severe: seepage, too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
594C2 Galland	Severe: wetness, percs slowly.	Severe: seepage, slope.	Severe: seepage, too clayey.	Slight	Poor: too clayey, hard to pack.
594D2 Galland	Severe: wetness, percs slowly.	Severe: seepage, slope.	Severe: seepage, too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
715:					
Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Amana	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
730B:					
Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Cantril	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
792C, 792C2, 792C3, 792D, 792D2, 792D3 Armstrong	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
795D2 Ashgrove	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
822D2--------------- Lamoni	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
831B--------------- Pershing	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
831C2--------------- Pershing	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
832B--------------- Weller	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
832C2--------------- Weller	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
993D2:					
Gara---------------	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Fair: too clayey, slope.
Armstrong----------	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
993D3:					
Gara---------------	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Armstrong----------	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
994E2:					
Douds--------------	Severe: slope.	Severe: seepage, slope.	Severe: seepage, wetness, slope.	Severe: seepage, slope.	Poor: slope.
Galland------------	Severe: wetness, percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
1130--------------- Belinda	Severe: wetness, percs slowly.	Slight----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
1139--------------- Perks Variant	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding.	Severe: flooding, seepage.	Fair: too clayey, wetness.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1260----------------- Beckwith	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
1715:					
Nodaway------------	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Lawson-------------	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Ackmore------------	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness, hard to pack.
1977---------------- Richwood Variant	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight-----------	Good.
5010, 5020. Pits					
5021. Orthents					
5030. Pits					
5040. Orthents					

TABLE 13.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
13B:				
Olmitz	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Vesser	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Zook	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
24D2 Shelby	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer, slope.
24E2 Shelby	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
51, 51+, 51B, 51B+ Vesser	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
54, 54+ Zook	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
56B Cantril	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
58D2 Douds	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
65E, 65E2 Lindley	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
65F, 65F2 Lindley	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
80B, 80C, 80C2, 80D2 Clinton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
93D2:				
Adair	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Shelby	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer, slope.
94E2:				
Caleb	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
94E2: Mystic	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
130 Belinda	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
131B Pershing	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
131C2 Pershing	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
132B, 132C, 132C2 Weller	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
179D2 Gara	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
179E, 179E2, 179E3, 179F, 179F2, 179F3 Gara	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
192C2, 192D2 Adair	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
211 Edina	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
222C2, 222C3 Clarinda	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
223C2, 223C3 Rinda	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
260 Beckwith	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
261 Appanoose	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
263 Okaw	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
269: Humeston	Poor: low strength, shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
273B: Olmitz	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
312B, 312B2: Seymour	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
313E2: Gosport	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
313G, 313G2: Gosport	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
362: Haig	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
364B: Grundy	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
405: Floris	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
423D2, 423D3: Bucknell	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
424D2:				
Lindley	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Keswick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
424E2:				
Lindley	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Keswick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
425C, 425C2, 425D, 425D2, 425D3: Keswick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
430------------------- Ackmore	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
451D2----------------- Caleb	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
452C2----------------- Lineville	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
453------------------- Tuskeego	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
484------------------- Lawson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
520, 520B------------- Coppock	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
531B, 531C, 531C2----- Kniffin	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
532B, 532C, 532C2----- Rathbun	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
587------------------- Chequest	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
592C2, 592D2, 592D3--- Mystic	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
594C2, 594D2---------- Galland	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
715:				
Nodaway----------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Amana------------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
730B:				
Nodaway----------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Cantril----------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
792C, 792C2, 792C3, 792D, 792D2, 792D3--- Armstrong	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
795D2----------------- Ashgrove	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
822D2: Lamoni	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
831B: Pershing	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
831C2: Pershing	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
832B, 832C2: Weller	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
993D2:				
Gara	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
Armstrong	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
993D3:				
Gara	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Armstrong	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
994E2:				
Douds	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Galland	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
1130: Belinda	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1139: Perks Variant	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
1260: Beckwith	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
1715:				
Nodaway	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Lawson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1715:				
Ackmore	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
1977 Richwood Variant	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
5010, 5020. Pits				
5021. Orthents				
5030. Pits				
5040. Orthents				

TABLE 14.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
13B:						
Olmitz	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Favorable	Favorable.
Vesser	Moderate: seepage, slope.	Severe: wetness.	Moderate: slow refill.	Frost action, slope.	Erodes easily, wetness.	Wetness, erodes easily.
Zook	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Wetness, percs slowly.
24D2, 24E2 Shelby	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope.
51, 51+ Vesser	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
51B, 51B+ Vesser	Moderate: seepage, slope.	Severe: wetness.	Moderate: slow refill.	Frost action, slope.	Erodes easily, wetness.	Wetness, erodes easily.
54, 54+ Zook	Slight	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Wetness, percs slowly.
56B Cantril	Moderate: seepage, slope.	Moderate: wetness.	Moderate: deep to water, slow refill.	Frost action, slope.	Wetness	Rooting depth.
58D2 Douds	Severe: seepage, slope.	Severe: piping.	Severe: cutbanks cave.	Deep to water	Slope, too sandy.	Slope, rooting depth.
65E, 65E2, 65F, 65F2 Lindley	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope.
80B, 80C, 80C2 Clinton	Moderate: seepage, slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
80D2 Clinton	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
93D2:						
Adair	Severe: slope.	Moderate: wetness.	Severe: no water.	Percs slowly, slope, frost action.	Slope, wetness.	Wetness, slope, percs slowly.
Shelby	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
94E2:						
Caleb	Severe: slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Slope	Slope, rooting depth.
Mystic	Severe: slope, seepage.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
130 Belinda	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
131B, 131C2 Pershing	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, erodes easily.	Erodes easily, percs slowly.
132B, 132C, 132C2 Weller	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Slope, percs slowly, frost action.	Wetness, erodes easily.	Percs slowly, erodes easily.
179D2, 179E, 179E2 Gara	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope.
179E3 Gara	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, rooting depth.
179F, 179F2 Gara	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope.
179F3 Gara	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, rooting depth.
192C2 Adair	Moderate: slope.	Moderate: wetness.	Severe: no water.	Percs slowly, slope, frost action.	Wetness	Wetness, percs slowly.
192D2 Adair	Severe: slope.	Moderate: wetness.	Severe: no water.	Percs slowly, slope, frost action.	Slope, wetness.	Wetness, slope, percs slowly.
211 Edina	Slight	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
222C2, 222C3 Clarinda	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Wetness, erodes easily.
223C2, 223C3 Rinda	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Wetness, erodes easily.
260 Beckwith	Slight	Severe: ponding.	Severe: no water.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
261 Appanoose	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
263 Okaw	Slight	Severe: hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
269 Humeston	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action, flooding.	Wetness, percs slowly.	Percs slowly, wetness.
273B Olmitz	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Favorable	Favorable.
312B, 312B2 Seymour	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: slow refill.	Percs slowly, slope.	Erodes easily, wetness.	Erodes easily, percs slowly.
313E2, 313G, 313G2 Gosport	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, area reclaim, erodes easily.	Slope, erodes easily, area reclaim.
362 Haig	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
364B Grundy	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Wetness, erodes easily.
405 Floris	Severe: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Erodes easily	Erodes easily.
423D2, 423D3 Bucknell	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Slope, wetness, percs slowly.	Wetness, slope, percs slowly.
424D2, 424E2: Lindley	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Slope.
Keswick	Severe: slope.	Moderate: wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
425C, 425C2 Keswick	Moderate: slope.	Moderate: wetness.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Wetness, erodes easily.
425D, 425D2, 425D3 Keswick	Severe: slope.	Moderate: wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
430 Ackmore	Moderate: seepage.	Severe: hard to pack, wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness, erodes easily.	Wetness, erodes easily.
451D2 Caleb	Severe: slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Slope	Slope, rooting depth.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
452C2 Lineville	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Wetness, erodes easily.
453 Tuskeego	Slight	Severe: wetness, hard to pack.	Severe: slow refill.	Percs slowly	Wetness, percs slowly.	Wetness, percs slowly.
484 Lawson	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
520 Coppock	Moderate: seepage.	Severe: hard to pack, wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness, erodes easily.	Wetness, erodes easily.
520B Coppock	Moderate: seepage, slope.	Severe: hard to pack, wetness.	Moderate: slow refill.	Frost action, slope.	Wetness, erodes easily.	Wetness, erodes easily.
531B, 531C, 531C2 Kniffin	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: slow refill.	Percs slowly, slope.	Erodes easily, wetness.	Erodes easily, percs slowly.
532B, 532C, 532C2 Rathbun	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: slow refill.	Percs slowly, slope.	Erodes easily, wetness.	Erodes easily, percs slowly.
587 Chequest	Slight	Severe: wetness.	Severe: slow refill.	Flooding, frost action.	Wetness, erodes easily.	Wetness, erodes easily.
592C2 Mystic	Severe: seepage.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
592D2, 592D3 Mystic	Severe: slope, seepage.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
594C2 Galland	Severe: seepage.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
594D2 Galland	Severe: seepage, slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
715:						
Nodaway	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Erodes easily	Erodes easily.
Amana	Moderate: seepage.	Moderate: wetness.	Moderate: deep to water, slow refill.	Flooding, frost action.	Erodes easily, wetness.	Erodes easily.
730B:						
Nodaway	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Erodes easily	Erodes easily.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
730B: Cantril	Moderate: seepage, slope.	Moderate: wetness.	Moderate: deep to water, slow refill.	Frost action, slope.	Wetness	Rooting depth.
792C, 792C2, 792C3 Armstrong	Moderate: slope.	Moderate: wetness, hard to pack.	Severe: no water.	Slope, percs slowly, frost action.	Percs slowly, wetness.	Percs slowly, wetness.
792D, 792D2, 792D3 Armstrong	Severe: slope.	Moderate: wetness, hard to pack.	Severe: no water.	Slope, percs slowly, frost action.	Slope, percs slowly, wetness.	Percs slowly, slope, wetness.
795D2 Ashgrove	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
822D2 Lamoni	Severe: slope.	Moderate: wetness, hard to pack.	Severe: no water.	Percs slowly, slope.	Slope, wetness, percs slowly.	Slope, wetness, percs slowly.
831B, 831C2 Pershing	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, erodes easily.	Erodes easily, percs slowly.
832B, 832C2 Weller	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Slope, percs slowly, frost action.	Wetness, erodes easily.	Percs slowly, erodes easily.
993D2: Gara	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope.
Armstrong	Severe: slope.	Moderate: wetness, hard to pack.	Severe: no water.	Slope, percs slowly, frost action.	Slope, percs slowly, wetness.	Percs slowly, slope, wetness.
993D3: Gara	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope, rooting depth.
Armstrong	Severe: slope.	Moderate: wetness, hard to pack.	Severe: no water.	Slope, percs slowly, frost action.	Slope, percs slowly, wetness.	Percs slowly, slope, wetness.
994E2: Douds	Severe: seepage, slope.	Severe: piping.	Severe: cutbanks cave.	Deep to water	Slope, too sandy.	Slope, rooting depth.
Galland	Severe: seepage, slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
1130 Belinda	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
1139----------- Perks Variant	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily, soil blowing.	Erodes easily.
1260----------- Beckwith	Slight---------	Severe: ponding.	Severe: no water.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
1715:						
Nodaway----------	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Erodes easily	Erodes easily.
Lawson-----------	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
Ackmore----------	Moderate: seepage.	Severe: hard to pack, wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness, erodes easily.	Wetness, erodes easily.
1977------------- Richwood Variant	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable------	Favorable.
5010, 5020. Pits						
5021. Orthents						
5030. Pits						
5040. Orthents						

TABLE 15.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
13B:											
Olmitz	0-10	Loam	CL	A-6	0	100	90-100	85-95	60-80	30-40	11-20
	10-21	Loam, clay loam	CL	A-6	0	100	90-100	85-95	60-80	30-40	11-20
	21-60	Clay loam	CL	A-6, A-7	0	100	90-100	85-95	60-80	35-45	15-25
Vesser	0-18	Silt loam	CL	A-6	0	100	100	98-100	95-100	30-40	10-20
	18-37	Silt loam	CL	A-6	0	100	100	98-100	95-100	30-40	10-20
	37-60	Silty clay loam	CL	A-7	0	100	100	98-100	95-100	40-50	15-25
Zook	0-9	Silty clay loam	CH, CL	A-7	0	100	100	95-100	95-100	45-65	20-35
	9-37	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	95-100	60-85	35-55
	37-60	Silty clay loam, silty clay, silt loam.	CH, CL	A-7, A-6	0	100	100	95-100	95-100	35-80	10-50
24D2, 24E2 Shelby	0-9	Loam	CL	A-6	0	95-100	85-95	75-90	55-70	30-40	10-20
	9-50	Clay loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
	50-60	Clay loam, loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
51, 51+, 51B, 51B+ Vesser	0-18	Silt loam	CL	A-6	0	100	100	98-100	95-100	30-40	10-20
	18-37	Silt loam	CL	A-6	0	100	100	98-100	95-100	30-40	10-20
	37-60	Silty clay loam	CL	A-7	0	100	100	98-100	95-100	40-50	15-25
54 Zook	0-9	Silty clay loam	CH, CL	A-7	0	100	100	95-100	95-100	45-65	20-35
	9-37	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	95-100	60-85	35-55
	37-60	Silty clay loam, silty clay.	CH, CL	A-7, A-6	0	100	100	95-100	95-100	35-80	10-50
54+ Zook	0-14	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	95-100	95-100	25-40	5-15
	14-37	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	95-100	60-85	35-55
	37-60	Silty clay loam, silty clay.	CH, CL	A-7, A-6	0	100	100	95-100	95-100	35-80	10-50
56B Cantril	0-23	Loam	CL	A-6	0	100	100	85-95	65-75	30-40	11-20
	23-60	Clay loam	CL	A-6, A-7	0	100	100	90-100	70-88	35-45	15-25
58D2 Douds	0-10	Loam	CL	A-6	0	95-100	85-100	70-90	60-80	25-35	10-20
	10-48	Clay loam, loam, sandy clay loam.	CL, SC	A-6, A-7	0	90-100	85-100	70-80	35-60	30-45	15-25
	48-60	Stratified loamy sand to clay loam.	SC, CL, SM-SC, CL-ML	A-4, A-6, A-2	0	90-100	85-100	65-85	20-60	15-35	5-15
65E, 65E2, 65F, 65F2 Lindley	0-8	Loam	CL	A-6	0	95-100	90-100	85-95	50-65	25-35	10-15
	8-35	Clay loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	12-20
	35-60	Loam, clay loam	CL	A-6	0	95-100	90-100	85-95	50-70	25-35	10-15

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
80B, 80C, 80C2, 80D2: Clinton	0-13	Silt loam	ML	A-4	0	100	100	100	95-100	30-40	5-10
	13-39	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	100	95-100	40-55	25-35
	39-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
93D2: Adair	0-7	Clay loam	CL	A-6	0	95-100	80-95	75-90	60-80	30-40	10-20
	7-25	Silty clay, clay, clay loam.	CL, CH	A-7	0	95-100	80-95	70-90	55-80	40-55	20-30
	25-60	Clay loam	CL	A-6, A-7	0	95-100	80-95	70-90	55-80	35-50	15-25
Shelby	0-9	Loam	CL	A-6	0	95-100	85-95	75-90	55-70	30-40	10-20
	9-50	Clay loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
	50-60	Clay loam, loam	CL	A-6, A-7	0-5	90-95	85-95	75-90	55-70	30-45	15-25
94E2: Caleb	0-8	Loam	CL	A-6	0	95-100	85-100	70-90	60-80	30-40	10-20
	8-35	Clay loam, loam, sandy clay loam.	CL	A-6, A-7	0	90-100	85-100	60-80	50-75	35-45	15-25
	35-60	Sandy clay loam, sandy loam, loamy sand.	SC, CL, SM-SC, CL-ML	A-6, A-4	0	95-100	85-100	70-90	35-80	20-40	5-20
Mystic	0-12	Silt loam	CL	A-6, A-7	0	100	100	80-100	65-90	30-45	10-25
	12-39	Clay loam, clay, silty clay.	CL, CH	A-7	0	100	90-100	80-100	65-80	40-55	25-35
	39-50	Sandy clay loam, loam.	SC, CL, SM-SC, CL-ML	A-6, A-4	0-5	90-100	80-100	70-95	40-65	25-40	5-20
	50-60	Stratified sandy loam to clay.	SM-SC, SC, CL-ML, CL	A-4, A-2, A-6	0-5	90-100	80-100	65-95	30-60	20-35	5-15
130: Belinda	0-9	Silt loam	CL, ML	A-4, A-6	0	100	100	100	95-100	30-40	5-15
	9-17	Silt loam	CL-ML, CL, ML	A-4	0	100	100	100	95-100	25-35	5-10
	17-51	Silty clay, silty clay loam.	CH	A-7	0	100	100	100	95-100	55-70	30-40
	51-60	Silty clay loam	CH	A-7	0	100	100	100	95-100	50-65	25-35
131B: Pershing	0-11	Silt loam	CL	A-6	0	100	100	100	95-100	30-40	10-20
	11-14	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	40-55	15-30
	14-35	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	40-65	20-40
	35-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	100	100	100	95-100	35-55	20-35
131C2: Pershing	0-7	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	40-55	15-30
	7-10	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	40-55	15-30
	10-31	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	40-65	20-40
	31-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	100	100	100	95-100	35-55	20-35
132B, 132C: Weller	0-14	Silt loam	ML, CL, CL-ML	A-6, A-4	0	100	100	100	95-100	25-40	5-15
	14-38	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	45-65	30-40
	38-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	100	100	100	95-100	30-55	10-30

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
132C2------------ Weller	0-6	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	40-55	25-35
	6-30	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	45-65	30-40
	30-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	100	100	100	95-100	30-55	10-30
179D2, 179E, 179E2----------- Gara	0-7	Loam-------------	CL, CL-ML	A-4, A-6	0	95-100	85-95	75-85	55-70	20-30	5-15
	7-40	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	40-60	Loam, clay loam	CL	A-6, A-7	0-5	90-95	85-95	70-85	55-75	35-45	15-25
179E3------------ Gara	0-4	Clay loam--------	CL	A-6, A-7	0	90-95	85-95	70-85	55-75	35-45	15-25
	4-36	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	36-60	Loam, clay loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
179F, 179F2------ Gara	0-7	Loam-------------	CL, CL-ML	A-4, A-6	0	95-100	85-95	75-85	55-70	20-30	5-15
	7-40	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	40-60	Loam, clay loam	CL	A-6, A-7	0-5	90-95	85-95	70-85	55-75	35-45	15-25
179F3------------ Gara	0-4	Clay loam--------	CL	A-6, A-7	0	90-95	85-95	70-85	55-75	35-45	15-25
	4-36	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	36-60	Loam, clay loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
192C2, 192D2----- Adair	0-7	Clay loam--------	CL	A-6	0	95-100	80-95	75-90	60-80	30-40	10-20
	7-25	Silty clay, clay, clay loam.	CL, CH	A-7	0	95-100	80-95	70-90	55-80	40-55	20-30
	25-60	Clay loam--------	CL	A-6, A-7	0	95-100	80-95	70-90	55-80	35-50	15-25
211-------------- Edina	0-20	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-40	5-15
	20-40	Silty clay-------	CH	A-7	0	100	100	95-100	90-100	55-75	30-45
	40-60	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	90-100	35-60	15-35
222C2, 222C3----- Clarinda	0-6	Silty clay loam	CL	A-7	0	100	95-100	90-100	85-100	40-50	20-30
	6-35	Silty clay, clay	CH	A-7	0	100	95-100	85-100	80-100	55-70	30-40
	35-60	Clay, silty clay	CH	A-7	0	95-100	95-100	80-95	75-90	55-70	35-45
223C2, 223C3----- Rinda	0-9	Silty clay loam	CL	A-7	0	100	95-100	90-100	85-100	40-50	20-30
	9-14	Silty clay loam	CL, CH	A-7	0	100	95-100	90-100	85-100	45-55	20-30
	14-60	Clay, silty clay	CH	A-7	0	95-100	95-100	80-95	75-90	55-70	35-45
260-------------- Beckwith	0-7	Silt loam--------	CL, ML, CL-ML	A-4	0	100	100	100	95-100	25-35	5-10
	7-15	Silt loam--------	CL, ML	A-4, A-6	0	100	100	100	95-100	30-40	5-15
	15-44	Silty clay, silty clay loam.	CH	A-7	0	100	100	100	95-100	55-70	30-40
	44-60	Silty clay loam	CH	A-7	0	100	100	100	95-100	50-65	25-35
261-------------- Appanoose	0-14	Silt loam--------	CL, ML	A-4, A-6	0	100	100	100	95-100	30-40	5-15
	14-36	Silty clay-------	CH	A-7	0	100	100	100	95-100	55-70	30-40
	36-60	Silty clay loam	CH	A-7	0	100	100	100	95-100	50-65	25-35
263-------------- Okaw	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	25-40	5-15
	13-47	Silty clay, clay, silty clay loam.	CH	A-7	0	100	95-100	95-100	85-100	50-70	30-50
	47-60	Silty clay loam, silty clay, clay.	CH, CL	A-7	0	100	100	95-100	80-100	45-65	20-35
269-------------- Humeston	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	95-100	25-40	5-15
	13-26	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	95-100	95-100	25-40	5-15
	26-60	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	95-100	95-100	45-55	25-35

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
273B Olmitz	0-10	Loam	CL	A-6	0	100	90-100	85-95	60-80	30-40	11-20
	10-21	Loam, clay loam	CL	A-6	0	100	90-100	85-95	60-80	30-40	11-20
	21-60	Clay loam	CL	A-6, A-7	0	100	90-100	85-95	60-80	35-45	15-25
312B Seymour	0-8	Silt loam	CL	A-6, A-7	0	100	100	100	95-100	30-45	10-20
	8-36	Silty clay, silty clay loam.	CH	A-7	0	100	100	100	95-100	55-70	30-40
	36-60	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	40-55	20-30
312B2 Seymour	0-7	Silty clay loam	CL	A-7, A-6	0	100	100	100	95-100	35-50	15-25
	7-27	Silty clay, silty clay loam.	CH	A-7	0	100	100	100	95-100	55-70	30-40
	27-60	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	40-55	20-30
313E2, 313G, 313G2 Gosport	0-3	Silt loam	CL, CL-ML	A-4, A-6	0	100	90-100	90-100	70-100	25-40	5-15
	3-24	Clay, silty clay, silty clay loam.	CH	A-7	0	100	90-100	90-100	85-100	50-65	35-50
	24-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
362 Haig	0-10	Silt loam	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	10-18	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	100	95-100	40-55	20-30
	18-34	Silty clay	CH	A-7	0	100	100	100	95-100	50-65	30-40
	34-60	Silty clay loam	CL, CH	A-7, A-6	0	100	100	100	95-100	35-55	20-30
364B Grundy	0-9	Silt loam	CL	A-6, A-7	0	100	100	95-100	90-100	30-45	10-20
	9-15	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	95-100	90-100	45-55	25-35
	15-31	Silty clay	CH	A-7	0	100	100	95-100	90-100	50-70	30-45
	31-60	Silty clay loam	CH, CL	A-7	0	100	100	90-100	90-100	40-55	25-35
405 Floris	0-4	Silt loam	CL, ML	A-4	0	100	95-100	90-100	50-75	<30	3-10
	4-23	Fine sandy loam, sandy loam.	SM, SC	A-2-4, A-4	0	100	95-100	65-95	20-45	<30	NP-10
	23-60	Loam, silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	95-100	70-100	25-35	5-15
423D2, 423D3 Bucknell	0-8	Silty clay loam	CL	A-6, A-7	0	95-100	95-100	80-95	70-95	35-45	15-25
	8-48	Clay, clay loam	CH	A-7	0	95-100	95-100	90-100	85-100	50-60	25-35
	48-60	Clay loam	CL	A-6, A-7	0	95-100	95-100	70-90	55-85	35-50	15-30
424D2, 424E2: Lindley	0-8	Loam	CL	A-6	0	95-100	90-100	85-95	50-65	25-35	10-15
	8-44	Clay loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	12-20
	44-60	Loam, clay loam	CL	A-6	0	95-100	90-100	85-95	50-70	25-35	10-15
Keswick	0-11	Loam	CL, CL-ML	A-6, A-4	0-5	90-100	80-100	75-90	60-80	20-30	5-15
	11-32	Clay loam, clay	CH, CL	A-7	0-5	90-100	80-100	70-90	55-80	40-70	20-40
	32-60	Clay loam	CL	A-6	0-5	90-100	80-100	70-90	55-80	30-40	15-25
425C, 425C2, 425D, 425D2 Keswick	0-11	Loam	CL, CL-ML	A-6, A-4	0-5	90-100	80-100	75-90	60-80	20-30	5-15
	11-32	Clay loam, clay	CH, CL	A-7	0-5	90-100	80-100	70-90	55-80	40-70	20-40
	32-60	Clay loam	CL	A-6	0-5	90-100	80-100	70-90	55-80	30-40	15-25
425D3 Keswick	0-4	Clay loam	CL	A-6, A-7	0-5	90-100	80-100	75-90	60-80	35-50	15-25
	4-25	Clay loam, clay	CH, CL	A-7	0-5	90-100	80-100	70-90	55-80	40-70	20-40
	25-60	Clay loam	CL	A-6	0-5	90-100	80-100	70-90	55-80	30-40	15-25

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
430-------------- Ackmore	0-9	Silt loam--------	CL, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	8-20
	9-31	Silt loam, silty clay loam.	CL, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	8-20
	31-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	100	100	95-100	85-100	35-60	15-30
451D2------------ Caleb	0-8	Loam-------------	CL	A-6	0	95-100	85-100	70-90	60-80	30-40	10-20
	8-35	Clay loam, loam, sandy clay loam.	CL	A-6, A-7	0	90-100	85-100	60-80	50-75	35-45	15-25
	35-60	Sandy clay loam, sandy loam, loamy sand.	SC, CL, SM-SC, CL-ML	A-6, A-4	0	95-100	85-100	70-90	35-80	20-40	5-20
452C2------------ Lineville	0-10	Silt loam--------	CL, ML	A-6, A-7	0	100	100	95-100	95-100	35-45	10-20
	10-17	Silty clay loam	CL, CH	A-7	0	100	100	95-100	95-100	45-55	25-35
	17-45	Clay loam, loam	CL	A-6, A-7	0	95-100	80-100	75-95	65-90	35-50	20-35
	45-60	Clay loam, clay	CH, CL	A-7	0-5	95-100	80-100	70-90	55-80	45-60	25-35
453-------------- Tuskeego	0-21	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	95-100	25-35	5-15
	21-38	Silty clay loam, silty clay.	CH	A-7	0	100	100	95-100	95-100	50-60	25-35
	38-60	Silty clay loam	CH, CL	A-7	0	100	100	95-100	95-100	45-55	25-35
484-------------- Lawson	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	85-100	20-40	5-20
	9-35	Silt loam, silty clay loam.	CL, CL-ML	A-4	0	100	100	90-100	85-100	20-30	5-10
	35-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	60-100	20-45	10-25
520, 520B-------- Coppock	0-9	Silt loam--------	CL	A-6	0	100	100	98-100	95-100	30-40	10-20
	9-27	Silt loam--------	CL	A-6	0	100	100	98-100	95-100	30-40	10-20
	27-44	Silty clay loam, silt loam.	CL, CH, MH	A-6, A-7	0	100	100	98-100	95-100	35-55	15-25
	44-60	Silty clay loam	CL, CH	A-7	0	100	100	98-100	95-100	40-60	15-30
531B, 531C------- Kniffin	0-11	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	100	100	98-100	95-100	35-45	10-20
	11-26	Silty clay-------	CH	A-7	0	100	100	100	95-100	55-70	30-40
	26-60	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	45-55	20-30
531C2------------ Kniffin	0-6	Silty clay loam	CL	A-7	0	100	100	98-100	95-100	40-50	20-30
	6-21	Silty clay-------	CH	A-7	0	100	100	100	95-100	55-70	30-40
	21-60	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	45-55	20-30
532B, 532C------- Rathbun	0-18	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	100	95-100	25-40	5-15
	18-40	Silty clay-------	CH	A-7	0	100	100	100	95-100	55-70	30-40
	40-60	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	45-55	20-30
532C2------------ Rathbun	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	6-31	Silty clay-------	CH	A-7	0	100	100	100	95-100	55-70	30-40
	31-60	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	45-55	20-30
587-------------- Chequest	0-14	Silty clay loam	CL	A-7	0	100	100	95-100	95-100	40-50	15-25
	14-60	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	90-100	45-60	20-30

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
592C2, 592D2----- Mystic	0-12	Silt loam--------	CL	A-6, A-7	0	100	100	80-100	65-90	30-45	10-25
	12-39	Clay loam, clay, silty clay.	CL, CH	A-7	0	100	90-100	80-100	65-80	40-55	25-35
	39-50	Sandy clay loam, loam.	SC, CL, SM-SC, CL-ML	A-6, A-4	0-5	90-100	80-100	70-95	40-65	25-40	5-20
	50-60	Stratified sandy loam to clay.	SM-SC, SC, CL-ML, CL	A-4, A-2, A-6	0-5	90-100	80-100	65-95	30-60	20-35	5-15
592D3------------ Mystic	0-5	Clay loam--------	CL	A-6, A-7	0	100	100	80-100	65-90	30-45	10-25
	5-32	Clay loam, clay, silty clay.	CL, CH	A-7	0	100	90-100	80-100	65-80	40-55	25-35
	32-43	Sandy clay loam, loam.	SC, CL, SM-SC, CL-ML	A-6, A-4	0-5	90-100	80-100	70-95	40-65	25-40	5-20
	43-60	Stratified sandy loam to clay.	SM-SC, SC, CL-ML, CL	A-4, A-2, A-6	0-5	90-100	80-100	65-95	30-60	20-35	5-15
594C2, 594D2----- Galland	0-10	Loam-------------	CL	A-6	0	90-100	80-100	75-100	65-90	30-40	10-20
	10-46	Clay loam, clay, silty clay.	CL, CH	A-7	0-5	90-100	80-100	75-100	65-80	40-55	25-35
	46-60	Stratified sandy loam to clay.	SM-SC, SC, CL-ML, CL	A-4, A-2, A-6	0-5	90-100	80-100	65-95	30-60	20-35	5-15
715:											
Nodaway---------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-35	5-15
	8-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-40	5-15
Amana-----------	0-16	Silt loam--------	CL	A-6	0	100	100	95-100	90-95	25-40	10-20
	16-53	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	90-95	35-45	15-25
	53-60	Silt loam, loam	CL	A-6	0	100	100	95-100	75-95	30-40	10-20
730B:											
Nodaway---------	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-35	5-15
	8-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-40	5-15
Cantril---------	0-23	Loam-------------	CL	A-6	0	100	100	85-95	65-75	30-40	11-20
	23-60	Clay loam--------	CL	A-6, A-7	0	100	100	90-100	70-88	35-45	15-25
792C, 792C2------ Armstrong	0-12	Loam-------------	CL, CL-ML	A-6, A-4	0-5	90-100	80-95	75-90	55-80	20-30	5-15
	12-43	Clay loam, clay, silty clay loam.	CL, CH, ML, MH	A-7	0-5	90-100	80-95	70-90	55-80	45-70	20-35
	43-60	Clay loam--------	CL	A-6	0-5	90-100	80-95	70-90	55-80	30-40	15-20
792C3------------ Armstrong	0-5	Clay loam--------	CL	A-6, A-7	0-5	90-100	80-95	75-90	55-80	35-45	15-25
	5-36	Clay loam, clay, silty clay loam.	CL, CH, ML, MH	A-7	0-5	90-100	80-95	70-90	55-80	45-70	20-35
	36-60	Clay loam--------	CL	A-6	0-5	90-100	80-95	70-90	55-80	30-40	15-20
792D, 792D2------ Armstrong	0-12	Loam-------------	CL, CL-ML	A-6, A-4	0-5	90-100	80-95	75-90	55-80	20-30	5-15
	12-43	Clay loam, clay, silty clay loam.	CL, CH, ML, MH	A-7	0-5	90-100	80-95	70-90	55-80	45-70	20-35
	43-60	Clay loam--------	CL	A-6	0-5	90-100	80-95	70-90	55-80	30-40	15-20
792D3------------ Armstrong	0-5	Clay loam--------	CL	A-6, A-7	0-5	90-100	80-95	75-90	55-80	35-45	15-25
	5-36	Clay loam, clay, silty clay loam.	CL, CH, ML, MH	A-7	0-5	90-100	80-95	70-90	55-80	45-70	20-35
	36-60	Clay loam--------	CL	A-6	0-5	90-100	80-95	70-90	55-80	30-40	15-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
795D2------------ Ashgrove	0-4	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	85-100	35-45	15-25
	4-60	Clay, silty clay	CH	A-7	0	95-100	95-100	75-90	75-90	50-60	25-35
822D2------------ Lamoni	0-15	Clay loam--------	CL	A-6, A-7	0	95-100	95-100	80-95	70-95	35-45	15-25
	15-33	Clay loam, clay	CH	A-7	0	95-100	95-100	90-100	85-100	50-60	25-35
	33-60	Clay loam--------	CL	A-6, A-7	0	95-100	95-100	70-90	55-85	35-50	15-30
831B------------- Pershing	0-11	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
	11-14	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	40-55	15-30
	14-35	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	40-65	20-40
	35-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	100	100	100	95-100	35-55	20-35
831C2------------ Pershing	0-7	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	40-55	15-30
	7-10	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	40-55	15-30
	10-31	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	40-65	20-40
	31-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	100	100	100	95-100	35-55	20-35
832B------------- Weller	0-14	Silt loam--------	ML, CL, CL-ML	A-6, A-4	0	100	100	100	95-100	25-40	5-15
	14-38	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	45-65	30-40
	38-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	100	100	100	95-100	30-55	10-30
832C2------------ Weller	0-6	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	40-55	25-35
	6-30	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	45-65	30-40
	30-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	100	100	100	95-100	30-55	10-30
993D2:											
Gara------------	0-7	Loam-------------	CL, CL-ML	A-4, A-6	0	95-100	85-95	75-85	55-70	20-30	5-15
	7-40	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	40-60	Loam, clay loam	CL	A-6, A-7	0-5	90-95	85-95	70-85	55-75	35-45	15-25
Armstrong-------	0-12	Loam-------------	CL, CL-ML	A-6, A-4	0-5	90-100	80-95	75-90	55-80	20-30	5-15
	12-43	Clay loam, clay, silty clay loam.	CL, CH, ML, MH	A-7	0-5	90-100	80-95	70-90	55-80	45-70	20-35
	43-60	Clay loam--------	CL	A-6	0-5	90-100	80-95	70-90	55-80	30-40	15-20
993D3:											
Gara------------	0-4	Clay loam--------	CL	A-6, A-7	0	90-95	85-95	70-85	55-75	35-45	15-25
	4-36	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	36-60	Loam, clay loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
Armstrong-------	0-5	Clay loam--------	CL	A-6, A-7	0-5	90-100	80-95	75-90	55-80	35-45	15-25
	5-36	Clay loam, clay, silty clay loam.	CL, CH, ML, MH	A-7	0-5	90-100	80-95	70-90	55-80	45-70	20-35
	36-60	Clay loam--------	CL	A-6	0-5	90-100	80-95	70-90	55-80	30-40	15-20
994E2:											
Douds-----------	0-10	Loam-------------	CL	A-6	0	95-100	85-100	70-90	60-80	25-35	10-20
	10-48	Clay loam, loam, sandy clay loam.	CL, SC	A-6, A-7	0	90-100	85-100	70-80	35-60	30-45	15-25
	48-60	Stratified loamy sand to clay loam.	SC, CL, SM-SC, CL-ML	A-4, A-6, A-2	0	90-100	85-100	65-85	20-60	15-35	5-15

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
994E2:											
Galland	0-10	Loam	CL	A-6	0	90-100	80-100	75-100	65-90	30-40	10-20
	10-46	Clay loam, clay, silty clay.	CL, CH	A-7	0-5	90-100	80-100	75-100	65-80	40-55	25-35
	46-60	Stratified sandy loam to clay.	SM-SC, SC, CL-ML, CL	A-4, A-2, A-6	0-5	90-100	80-100	65-95	30-60	20-35	5-15
1130 Belinda	0-9	Silt loam	CL, ML	A-4, A-6	0	100	100	100	95-100	30-40	5-15
	9-17	Silt loam	CL-ML, ML	A-4	0	100	100	100	95-100	25-35	5-10
	17-51	Silty clay, silty clay loam.	CH	A-7	0	100	100	100	95-100	55-70	30-40
	51-60	Silty clay loam	CH	A-7	0	100	100	100	95-100	50-65	25-35
1139 Perks Variant	0-7	Sand	SM, SP, SP-SM	A-1	0	90-100	90-95	30-50	3-20	---	NP
	7-26	Sand, sandy loam	SM, SP-SM	A-1, A-2, A-3, A-4	0	90-100	90-95	40-60	5-45	---	NP
	26-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-35	5-15
1260 Beckwith	0-7	Silt loam	CL, ML, CL-ML	A-4	0	100	100	100	95-100	25-35	5-10
	7-15	Silt loam	CL, ML	A-4, A-6	0	100	100	100	95-100	30-40	5-15
	15-44	Silty clay, silty clay loam.	CH	A-7	0	100	100	100	95-100	55-70	30-40
	44-60	Silty clay loam	CH	A-7	0	100	100	100	95-100	50-65	25-35
1715:											
Nodaway	0-8	Silt loam	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-35	5-15
	8-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-40	5-15
Lawson	0-9	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	85-100	20-40	5-20
	9-35	Silt loam, silty clay loam.	CL, CL-ML	A-4	0	100	100	90-100	85-100	20-30	5-10
	35-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	60-100	20-45	10-25
Ackmore	0-9	Silt loam	CL, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	8-20
	9-31	Silt loam, silty clay loam.	CL, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	8-20
	31-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	100	100	95-100	85-100	35-60	15-30
1977 Richwood Variant	0-20	Loam	CL, CL-ML	A-4, A-6	0	95-100	90-100	70-90	50-70	20-35	5-15
	20-50	Loam	CL, CL-ML	A-4, A-6	0	95-100	90-100	70-90	50-70	20-35	5-15
	50-60	Loam, sandy loam, silt loam.	CL-ML, SC, CL, SM-SC	A-4	0	95-100	90-100	70-90	40-60	20-30	5-10
5010, 5020. Pits											
5021. Orthents											
5030. Pits											
5040. Orthents											

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	Pct	g/cc	In/hr	In/in	pH				
13B:										
Olmitz----------	0-10	24-30	1.40-1.45	0.6-2.0	0.19-0.21	5.6-7.3	Moderate-----	0.28	5	6
	10-21	24-30	1.40-1.45	0.6-2.0	0.19-0.21	5.6-7.3	Moderate-----	0.28		
	21-60	28-34	1.45-1.55	0.6-2.0	0.15-0.17	5.1-6.5	Moderate-----	0.28		
Vesser----------	0-18	20-26	1.30-1.35	0.6-2.0	0.20-0.24	5.6-7.3	Moderate-----	0.32	5	6
	18-37	18-22	1.35-1.40	0.6-2.0	0.18-0.22	5.1-6.0	Moderate-----	0.43		
	37-60	30-35	1.40-1.45	0.6-2.0	0.17-0.21	5.1-6.5	Moderate-----	0.43		
Zook------------	0-9	32-38	1.30-1.35	0.2-0.6	0.21-0.23	5.6-7.3	High---------	0.28	5	7
	9-37	36-45	1.30-1.45	0.06-0.2	0.11-0.13	5.6-7.8	High---------	0.28		
	37-60	20-45	1.30-1.45	0.06-0.6	0.11-0.22	5.6-7.8	High---------	0.28		
24D2, 24E2------- Shelby	0-9	24-27	1.50-1.55	0.6-2.0	0.20-0.22	5.1-7.3	Moderate-----	0.28	5	6
	9-50	30-35	1.55-1.65	0.2-0.6	0.16-0.18	5.1-7.3	Moderate-----	0.28		
	50-60	25-35	1.55-1.65	0.2-0.6	0.16-0.18	6.6-8.4	Moderate-----	0.37		
51, 51+, 51B, 51B+------------ Vesser	0-18	20-26	1.30-1.35	0.6-2.0	0.20-0.24	5.6-7.3	Moderate-----	0.32	5	6
	18-37	18-22	1.35-1.40	0.6-2.0	0.18-0.22	5.1-6.0	Moderate-----	0.43		
	37-60	30-35	1.40-1.45	0.6-2.0	0.17-0.21	5.1-6.5	Moderate-----	0.43		
54--------------- Zook	0-9	32-38	1.30-1.35	0.2-0.6	0.21-0.23	5.6-7.3	High---------	0.28	5	7
	9-37	36-45	1.30-1.45	0.06-0.2	0.11-0.13	5.6-7.8	High---------	0.28		
	37-60	27-45	1.30-1.45	0.06-0.6	0.11-0.22	5.6-7.8	High---------	0.28		
54+-------------- Zook	0-14	20-26	1.30-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.28	5	6
	14-37	36-45	1.30-1.45	0.06-0.2	0.11-0.13	5.6-7.8	High---------	0.28		
	37-60	27-45	1.30-1.45	0.06-0.6	0.11-0.22	5.6-7.8	High---------	0.28		
56B-------------- Cantril	0-23	14-27	1.40-1.45	0.6-2.0	0.17-0.19	5.1-7.3	Low----------	0.32	5	6
	23-60	27-35	1.45-1.75	0.6-2.0	0.14-0.16	5.1-6.5	Moderate-----	0.32		
58D2------------- Douds	0-10	20-27	1.45-1.50	0.6-2.0	0.15-0.17	5.1-7.3	Low----------	0.32	5	6
	10-48	26-35	1.45-1.65	0.6-2.0	0.15-0.17	4.5-6.0	Moderate-----	0.32		
	48-60	5-30	1.55-1.75	0.6-6.0	0.11-0.13	5.1-6.0	Low----------	0.32		
65E, 65E2, 65F, 65F2------------ Lindley	0-8	18-27	1.20-1.40	0.6-2.0	0.16-0.18	4.5-7.3	Low----------	0.32	5	6
	8-35	30-35	1.40-1.60	0.2-0.6	0.14-0.18	4.5-6.5	Moderate-----	0.32		
	35-60	18-32	1.45-1.65	0.2-0.6	0.12-0.16	6.1-7.8	Moderate-----	0.32		
80B, 80C, 80C2, 80D2------------ Clinton	0-13	16-26	1.30-1.40	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.37	5	6
	13-39	36-42	1.35-1.45	0.2-0.6	0.16-0.20	4.5-6.0	Moderate-----	0.37		
	39-60	24-35	1.40-1.55	0.6-2.0	0.18-0.20	5.6-6.5	Moderate-----	0.37		
93D2:										
Adair-----------	0-7	35-42	1.45-1.50	0.2-0.6	0.17-0.19	5.6-7.3	Moderate-----	0.32	3	4
	7-25	38-60	1.50-1.60	0.06-0.2	0.13-0.16	5.1-6.5	High---------	0.32		
	25-60	30-38	1.60-1.70	0.2-0.6	0.14-0.16	5.6-8.4	Moderate-----	0.32		

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodi-bility group
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				
93D2:										
Shelby----------	0-9	24-27	1.50-1.55	0.6-2.0	0.20-0.22	5.1-7.3	Moderate-----	0.28	5	6
	9-50	30-35	1.55-1.65	0.2-0.6	0.16-0.18	5.1-7.3	Moderate-----	0.28		
	50-60	25-35	1.55-1.65	0.2-0.6	0.16-0.18	6.6-8.4	Moderate-----	0.37		
94E2:										
Caleb-----------	0-8	22-29	1.45-1.50	0.6-2.0	0.14-0.18	4.5-7.3	Low----------	0.28	5	6
	8-35	20-35	1.45-1.65	0.6-2.0	0.14-0.18	4.5-6.5	Moderate-----	0.28		
	35-60	5-30	1.55-1.75	0.6-2.0	0.12-0.16	5.6-6.5	Low----------	0.28		
Mystic----------	0-12	22-29	1.40-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Moderate-----	0.37	3	6
	12-39	30-48	1.45-1.65	0.06-0.2	0.15-0.19	4.5-6.5	High---------	0.37		
	39-50	20-35	1.65-1.75	0.6-2.0	0.16-0.18	5.6-6.5	Moderate-----	0.37		
	50-60	10-30	1.65-1.75	0.6-6.0	0.11-0.13	5.6-7.3	Low----------	0.24		
130-------------- Belinda	0-9	16-22	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	3	6
	9-17	18-27	1.30-1.35	0.6-2.0	0.20-0.22	4.5-6.0	Low----------	0.37		
	17-51	42-52	1.30-1.45	<0.06	0.12-0.14	4.5-5.5	High---------	0.28		
	51-60	28-40	1.40-1.50	0.06-0.6	0.18-0.20	5.1-6.0	High---------	0.28		
131B------------- Pershing	0-11	20-27	1.30-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.37	3	6
	11-14	27-35	1.30-1.40	0.2-0.6	0.20-0.22	5.1-6.0	Moderate-----	0.37		
	14-35	35-48	1.35-1.45	0.06-0.2	0.18-0.20	5.1-6.0	High---------	0.37		
	35-60	24-40	1.35-1.50	0.2-0.6	0.18-0.20	5.1-6.5	High---------	0.37		
131C2------------ Pershing	0-7	27-38	1.30-1.40	0.2-0.6	0.22-0.24	4.5-7.3	Moderate-----	0.37	3	7
	7-10	27-35	1.30-1.40	0.2-0.6	0.20-0.22	5.1-6.0	Moderate-----	0.37		
	10-31	42-48	1.35-1.45	0.06-0.2	0.18-0.20	5.1-6.0	High---------	0.37		
	31-60	24-40	1.35-1.50	0.2-0.6	0.18-0.20	5.1-6.5	High---------	0.37		
132B, 132C------- Weller	0-14	16-27	1.35-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.43	3	6
	14-38	28-48	1.35-1.50	0.06-0.2	0.12-0.18	4.5-6.0	High---------	0.43		
	38-60	25-40	1.40-1.55	0.2-0.6	0.18-0.20	4.5-6.0	High---------	0.43		
132C2------------ Weller	0-6	27-36	1.35-1.45	0.2-0.6	0.22-0.24	4.5-7.3	High---------	0.43	3	7
	6-30	28-48	1.35-1.50	0.06-0.2	0.12-0.18	4.5-6.0	High---------	0.43		
	30-60	25-40	1.40-1.55	0.2-0.6	0.18-0.20	4.5-6.0	High---------	0.43		
179D2, 179E, 179E2----------- Gara	0-7	24-27	1.50-1.55	0.6-2.0	0.20-0.22	5.6-7.3	Moderate-----	0.28	5	6
	7-40	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-6.5	Moderate-----	0.28		
	40-60	24-38	1.65-1.75	0.2-0.6	0.16-0.18	6.1-8.4	Moderate-----	0.37		
179E3------------ Gara	0-4	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.6-7.3	Moderate-----	0.28	4	6
	4-36	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-6.5	Moderate-----	0.28		
	36-60	24-38	1.65-1.75	0.2-0.6	0.16-0.18	6.1-8.4	Moderate-----	0.37		
179F, 179F2------ Gara	0-7	24-27	1.50-1.55	0.6-2.0	0.20-0.22	5.6-7.3	Moderate-----	0.28	5	6
	7-40	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-6.5	Moderate-----	0.28		
	40-60	24-38	1.65-1.75	0.2-0.6	0.16-0.18	6.1-8.4	Moderate-----	0.37		
179F3------------ Gara	0-4	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.6-7.3	Moderate-----	0.28	4	6
	4-36	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-6.5	Moderate-----	0.28		
	36-60	24-38	1.65-1.75	0.2-0.6	0.16-0.18	6.1-8.4	Moderate-----	0.37		
192C2, 192D2----- Adair	0-7	35-42	1.45-1.50	0.2-0.6	0.17-0.19	5.6-7.3	Moderate-----	0.32	3	4
	7-25	38-60	1.50-1.60	0.06-0.2	0.13-0.16	5.1-6.5	High---------	0.32		
	25-60	30-38	1.60-1.70	0.2-0.6	0.14-0.16	5.6-8.4	Moderate-----	0.32		

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in	pH				
211---------------- Edina	0-20	15-27	1.35-1.45	0.6-2.0	0.22-0.24	5.1-7.3	Moderate-----	0.37	3	6
	20-40	45-60	1.30-1.45	<0.06	0.11-0.13	5.6-7.3	Very high----	0.37		
	40-60	27-40	1.35-1.50	0.06-0.2	0.18-0.20	6.6-7.3	High---------	0.37		
222C2, 222C3----- Clarinda	0-6	30-38	1.45-1.50	0.2-0.6	0.17-0.19	5.1-7.3	Moderate-----	0.37	3-2	7
	6-35	40-60	1.45-1.60	<0.06	0.14-0.16	5.1-6.5	High---------	0.37		
	35-60	40-60	1.50-1.60	<0.06	0.14-0.16	5.6-8.4	High---------	0.37		
223C2, 223C3----- Rinda	0-9	27-35	1.45-1.50	0.2-0.6	0.20-0.22	5.6-7.3	Moderate-----	0.43	3-2	7
	9-14	30-40	1.45-1.50	0.2-0.6	0.18-0.20	5.1-6.5	High---------	0.43		
	14-60	40-60	1.45-1.60	<0.06	0.14-0.16	5.1-7.8	High---------	0.32		
260-------------- Beckwith	0-7	16-22	1.35-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.37	3	6
	7-15	18-27	1.30-1.35	0.6-2.0	0.20-0.22	4.5-5.5	Low----------	0.37		
	15-44	40-52	1.30-1.45	<0.06	0.12-0.14	4.5-6.0	High---------	0.28		
	44-60	28-40	1.40-1.50	0.2-0.6	0.18-0.20	5.6-6.5	High---------	0.37		
261-------------- Appanoose	0-14	16-22	1.35-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.32	3	6
	14-36	48-60	1.40-1.50	<0.06	0.12-0.14	5.1-6.5	High---------	0.43		
	36-60	30-40	1.50-1.55	0.06-0.2	0.18-0.20	5.6-6.5	High---------	0.43		
263-------------- Okaw	0-13	15-27	1.20-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.43	3	6
	13-47	40-48	1.35-1.60	<0.06	0.09-0.18	4.5-6.0	High---------	0.32		
	47-60	35-55	1.50-1.70	<0.06	0.08-0.20	3.6-8.4	High---------	0.32		
269-------------- Humeston	0-13	24-27	1.35-1.40	0.6-2.0	0.21-0.23	5.1-7.3	Low----------	0.32	4	6
	13-26	20-26	1.30-1.35	0.2-2.0	0.20-0.22	4.5-6.0	Moderate-----	0.32		
	26-60	30-48	1.35-1.50	<0.06	0.13-0.15	4.5-7.3	High---------	0.32		
273B------------- Olmitz	0-10	24-30	1.40-1.45	0.6-2.0	0.19-0.21	5.6-7.3	Moderate-----	0.28	5	6
	10-21	24-30	1.40-1.45	0.6-2.0	0.19-0.21	5.6-7.3	Moderate-----	0.28		
	21-60	28-34	1.45-1.55	0.6-2.0	0.15-0.17	5.1-6.5	Moderate-----	0.28		
312B------------- Seymour	0-8	22-27	1.35-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	3	6
	8-36	36-55	1.40-1.45	<0.06	0.12-0.18	5.1-6.5	High---------	0.37		
	36-60	35-40	1.45-1.50	0.2-0.6	0.18-0.20	5.6-7.3	High---------	0.37		
312B2------------ Seymour	0-7	28-32	1.40-1.45	0.2-0.6	0.18-0.20	5.6-7.3	Moderate-----	0.37	3	7
	7-27	48-55	1.40-1.45	<0.06	0.12-0.18	5.1-6.5	High---------	0.37		
	27-60	35-40	1.45-1.50	0.2-0.6	0.18-0.20	5.6-7.3	High---------	0.37		
313E2, 313G, 313G2----------- Gosport	0-3	18-27	1.30-1.40	0.2-0.6	0.18-0.20	5.1-7.3	Low----------	0.43	3	6
	3-24	36-60	1.50-1.60	<0.06	0.12-0.14	3.6-6.0	High---------	0.32		
	24-60	---	---	---	---	---	-------------	----		
362-------------- Haig	0-10	22-27	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.37	3	6
	10-18	28-48	1.30-1.35	0.6-2.0	0.21-0.23	5.1-6.0	High---------	0.37		
	18-34	40-50	1.30-1.45	0.06-0.2	0.12-0.14	5.1-6.0	High---------	0.37		
	34-60	28-40	1.40-1.50	0.2-0.6	0.18-0.20	6.1-7.3	High---------	0.37		
364B------------- Grundy	0-9	12-27	1.35-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.37	3	6
	9-15	32-45	1.35-1.45	0.2-0.6	0.18-0.20	5.6-6.5	High---------	0.37		
	15-31	40-50	1.30-1.40	0.06-0.2	0.11-0.13	5.1-7.3	High---------	0.37		
	31-60	28-35	1.35-1.40	0.06-0.2	0.18-0.20	5.6-7.3	High---------	0.37		
405-------------- Floris	0-4	10-18	1.50-1.55	2.0-6.0	0.20-0.22	6.1-7.3	Low----------	0.32	5	5
	4-23	5-18	1.50-1.60	2.0-6.0	0.13-0.18	6.1-7.3	Low----------	0.20		
	23-60	18-30	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Moderate-----	0.37		

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				
423D2, 423D3----- Bucknell	0-8	27-38	1.45-1.50	0.2-0.6	0.17-0.21	5.1-7.3	Moderate-----	0.32	3-2	6
	8-48	38-50	1.55-1.65	0.06-0.2	0.13-0.17	4.5-6.0	High---------	0.32		
	48-60	30-40	1.60-1.70	0.06-0.2	0.14-0.18	5.6-7.3	High---------	0.32		
424D2, 424E2:										
Lindley---------	0-8	18-27	1.20-1.40	0.6-2.0	0.16-0.18	4.5-7.3	Low----------	0.32	5	6
	8-44	30-35	1.40-1.60	0.2-0.6	0.14-0.18	4.5-6.5	Moderate-----	0.32		
	44-60	18-32	1.45-1.65	0.2-0.6	0.12-0.16	6.1-7.8	Moderate-----	0.32		
Keswick---------	0-11	22-27	1.45-1.50	0.6-2.0	0.17-0.22	4.5-7.3	Moderate-----	0.37	3	6
	11-32	35-60	1.45-1.60	0.06-0.2	0.11-0.15	4.5-6.0	High---------	0.37		
	32-60	30-40	1.60-1.75	0.2-0.6	0.12-0.16	4.5-7.3	Moderate-----	0.37		
425C, 425C2, 425D, 425D2----- Keswick	0-11	22-27	1.45-1.50	0.6-2.0	0.17-0.22	4.5-7.3	Moderate-----	0.37	3	6
	11-32	35-60	1.45-1.60	0.06-0.2	0.11-0.15	4.5-6.0	High---------	0.37		
	32-60	30-40	1.60-1.75	0.2-0.6	0.12-0.16	4.5-7.3	Moderate-----	0.37		
425D3------------ Keswick	0-4	27-40	1.45-1.50	0.2-0.6	0.17-0.19	4.5-7.3	Moderate-----	0.37	2	4
	4-25	35-60	1.45-1.60	0.06-0.2	0.11-0.15	4.5-6.0	High---------	0.37		
	25-60	30-40	1.60-1.75	0.2-0.6	0.12-0.16	4.5-7.3	Moderate-----	0.37		
430-------------- Ackmore	0-9	25-27	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.37	5	6
	9-31	25-30	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.37		
	31-60	26-38	1.30-1.40	0.6-2.0	0.18-0.20	5.6-7.8	High---------	0.37		
451D2------------ Caleb	0-8	22-29	1.45-1.50	0.6-2.0	0.14-0.18	4.5-7.3	Low----------	0.28	5	6
	8-35	20-35	1.45-1.65	0.6-2.0	0.14-0.18	4.5-6.5	Moderate-----	0.28		
	35-60	5-30	1.55-1.75	0.6-2.0	0.12-0.16	5.6-6.5	Low----------	0.28		
452C2------------ Lineville	0-10	22-27	1.45-1.50	0.6-2.0	0.16-0.20	5.1-7.3	Moderate-----	0.37	5	6
	10-17	28-35	1.50-1.55	0.2-0.6	0.17-0.21	5.1-6.0	Moderate-----	0.37		
	17-45	20-35	1.65-1.75	0.06-0.2	0.17-0.21	5.6-6.5	Moderate-----	0.37		
	45-60	28-45	1.65-1.75	0.06-0.2	0.13-0.21	5.6-7.3	High---------	0.37		
453-------------- Tuskeego	0-21	16-22	1.35-1.40	0.6-2.0	0.19-0.23	5.1-7.3	Moderate-----	0.32	3	5
	21-38	32-48	1.30-1.45	<0.06	0.13-0.17	5.1-6.5	High---------	0.32		
	38-60	28-40	1.40-1.50	0.06-0.2	0.16-0.19	5.6-6.5	Moderate-----	0.32		
484-------------- Lawson	0-9	10-27	1.20-1.55	0.6-2.0	0.22-0.24	6.1-7.8	Low----------	0.28	5	5
	9-35	10-30	1.20-1.55	0.6-2.0	0.18-0.22	6.1-7.8	Low----------	0.28		
	35-60	18-30	1.55-1.65	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.43		
520, 520B-------- Coppock	0-9	16-26	1.30-1.35	0.6-2.0	0.20-0.24	6.1-7.3	Moderate-----	0.32	5	6
	9-27	16-27	1.30-1.40	0.6-2.0	0.18-0.22	5.1-7.3	Moderate-----	0.43		
	27-44	24-35	1.30-1.40	0.6-2.0	0.17-0.21	4.5-6.0	Moderate-----	0.43		
	44-60	24-40	1.40-1.45	0.6-2.0	0.15-0.19	4.5-6.0	Moderate-----	0.43		
531B, 531C------- Kniffin	0-11	22-34	1.35-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.37	3	6
	11-26	48-56	1.40-1.45	<0.06	0.12-0.14	4.5-6.0	High---------	0.37		
	26-60	32-40	1.45-1.50	0.2-0.6	0.18-0.20	5.1-7.3	High---------	0.37		
531C2------------ Kniffin	0-6	28-34	1.40-1.45	0.2-0.6	0.18-0.20	4.5-7.3	Moderate-----	0.37	3	7
	6-21	48-56	1.40-1.45	<0.06	0.12-0.14	4.5-6.0	High---------	0.37		
	21-60	32-40	1.45-1.50	0.2-0.6	0.18-0.20	5.1-7.3	High---------	0.37		
532B, 532C------- Rathbun	0-18	16-22	1.35-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.43	3	6
	18-40	48-56	1.40-1.45	<0.06	0.12-0.14	4.5-5.5	High---------	0.32		
	40-60	32-40	1.45-1.50	0.2-0.6	0.18-0.20	5.6-6.5	High---------	0.32		

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in	pH				
532C2------------ Rathbun	0-6	28-34	1.40-1.45	0.2-0.6	0.18-0.20	4.5-7.3	Moderate-----	0.43	3	7
	6-31	48-56	1.40-1.45	<0.06	0.12-0.14	4.5-5.5	High---------	0.32		
	31-60	32-40	1.45-1.50	0.2-0.6	0.18-0.20	5.6-6.5	High---------	0.32		
587-------------- Chequest	0-14	30-35	1.30-1.35	0.2-0.6	0.18-0.20	5.1-7.3	High---------	0.28	5	7
	14-60	35-42	1.35-1.45	0.2-0.6	0.14-0.18	5.1-6.5	High---------	0.43		
592C2, 592D2----- Mystic	0-12	22-29	1.40-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Moderate-----	0.37	3	6
	12-39	30-48	1.45-1.65	0.06-0.2	0.15-0.19	4.5-6.5	High---------	0.37		
	39-50	20-35	1.65-1.75	0.6-2.0	0.16-0.18	5.6-6.5	Moderate-----	0.37		
	50-60	10-30	1.65-1.75	0.6-6.0	0.11-0.13	5.6-7.3	Low----------	0.24		
592D3------------ Mystic	0-5	27-32	1.40-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Moderate-----	0.37	2	6
	5-32	30-48	1.45-1.65	0.06-0.2	0.15-0.19	4.5-6.5	High---------	0.37		
	32-43	20-35	1.65-1.75	0.6-2.0	0.16-0.18	5.6-6.5	Moderate-----	0.37		
	43-60	10-30	1.65-1.75	0.6-6.0	0.11-0.13	5.6-7.3	Low----------	0.24		
594C2, 594D2----- Galland	0-10	22-27	1.45-1.50	0.6-2.0	0.19-0.21	5.6-7.3	Moderate-----	0.37	3	6
	10-46	35-48	1.45-1.65	0.06-0.2	0.14-0.19	4.5-6.5	High---------	0.37		
	46-60	10-45	1.55-1.75	0.6-6.0	0.11-0.13	6.1-6.5	Low----------	0.24		
715:										
Nodaway---------	0-8	18-27	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Low----------	0.37	5	6
	8-60	18-28	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Moderate-----	0.37		
Amana-----------	0-16	18-27	1.20-1.30	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.37	5	6
	16-53	18-30	1.25-1.40	0.6-2.0	0.20-0.22	5.1-7.3	Moderate-----	0.37		
	53-60	18-26	1.25-1.40	0.6-2.0	0.20-0.22	5.6-6.5	Moderate-----	0.37		
730B:										
Nodaway---------	0-8	18-27	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Low----------	0.37	5	6
	8-60	18-28	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Moderate-----	0.37		
Cantril---------	0-23	14-27	1.40-1.45	0.6-2.0	0.17-0.19	5.1-7.3	Low----------	0.32	5	6
	23-60	27-35	1.45-1.75	0.6-2.0	0.14-0.16	5.1-6.5	Moderate-----	0.32		
792C, 792C2------ Armstrong	0-12	22-27	1.45-1.50	0.6-2.0	0.20-0.22	5.1-7.3	Moderate-----	0.32	3	6
	12-43	36-60	1.45-1.55	0.06-0.2	0.11-0.16	4.5-6.5	High---------	0.32		
	43-60	30-36	1.55-1.70	0.2-0.6	0.14-0.16	5.1-7.3	Moderate-----	0.32		
792C3------------ Armstrong	0-5	35-42	1.45-1.50	0.2-0.6	0.18-0.20	5.1-7.3	Moderate-----	0.32	3-2	4
	5-36	36-60	1.45-1.55	0.06-0.2	0.11-0.16	4.5-6.5	High---------	0.32		
	36-60	30-36	1.55-1.70	0.2-0.6	0.14-0.16	5.1-7.3	Moderate-----	0.32		
792D, 792D2------ Armstrong	0-12	22-27	1.45-1.50	0.6-2.0	0.20-0.22	5.1-7.3	Moderate-----	0.32	3	6
	12-43	36-60	1.45-1.55	0.06-0.2	0.11-0.16	4.5-6.5	High---------	0.32		
	43-60	30-36	1.55-1.70	0.2-0.6	0.14-0.16	5.1-7.3	Moderate-----	0.32		
792D3------------ Armstrong	0-5	35-42	1.45-1.50	0.2-0.6	0.18-0.20	5.1-7.3	Moderate-----	0.32	3-2	4
	5-36	36-60	1.45-1.55	0.06-0.2	0.11-0.16	4.5-6.5	High---------	0.32		
	36-60	30-36	1.55-1.70	0.2-0.6	0.14-0.16	5.1-7.3	Moderate-----	0.32		
795D2------------ Ashgrove	0-4	27-40	1.45-1.50	0.2-0.6	0.18-0.20	4.5-7.3	Moderate-----	0.43	3-2	7
	4-60	40-60	1.45-1.65	<0.06	0.12-0.14	4.5-7.3	High---------	0.32		
822D2------------ Lamoni	0-15	27-40	1.45-1.50	0.2-0.6	0.17-0.21	5.1-7.3	Moderate-----	0.32	2	6
	15-33	38-50	1.55-1.65	<0.2	0.13-0.17	5.1-7.3	High---------	0.32		
	33-60	32-40	1.60-1.70	0.06-0.2	0.14-0.18	5.6-7.8	High---------	0.32		

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in	pH				
831B------------- Pershing	0-11	20-27	1.30-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.37	3	6
	11-14	27-35	1.30-1.40	0.2-0.6	0.20-0.22	5.1-6.0	Moderate-----	0.37		
	14-35	35-48	1.35-1.45	0.06-0.2	0.18-0.20	5.1-6.0	High----------	0.37		
	35-60	24-40	1.35-1.50	0.2-0.6	0.18-0.20	5.1-6.5	High----------	0.37		
831C2------------ Pershing	0-7	27-38	1.30-1.40	0.2-0.6	0.22-0.24	4.5-7.3	Moderate-----	0.37	3	7
	7-10	27-35	1.30-1.40	0.2-0.6	0.20-0.22	5.1-6.0	Moderate-----	0.37		
	10-31	35-48	1.35-1.45	0.06-0.2	0.18-0.20	5.1-6.0	High----------	0.37		
	31-60	24-40	1.35-1.50	0.2-0.6	0.18-0.20	5.1-6.5	High----------	0.37		
832B------------- Weller	0-14	16-27	1.35-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.43	3	6
	14-38	28-48	1.35-1.50	0.06-0.2	0.12-0.18	4.5-6.0	High----------	0.43		
	38-60	25-40	1.40-1.55	0.2-0.6	0.18-0.20	4.5-6.0	High----------	0.43		
832C2------------ Weller	0-6	27-36	1.35-1.45	0.2-0.6	0.22-0.24	4.5-7.3	High----------	0.43	2	7
	6-30	28-48	1.35-1.50	0.06-0.2	0.12-0.18	4.5-6.0	High----------	0.43		
	30-60	25-40	1.40-1.55	0.2-0.6	0.18-0.20	4.5-6.0	High----------	0.43		
993D2:										
Gara------------	0-7	24-27	1.50-1.55	0.6-2.0	0.20-0.22	5.6-7.3	Moderate-----	0.28	5	6
	7-40	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-6.5	Moderate-----	0.28		
	40-60	24-38	1.65-1.75	0.2-0.6	0.16-0.18	6.1-8.4	Moderate-----	0.37		
Armstrong--------	0-12	24-27	1.45-1.50	0.6-2.0	0.20-0.22	5.1-7.3	Moderate-----	0.32	3	6
	12-43	36-60	1.45-1.55	0.06-0.2	0.11-0.16	4.5-6.5	High----------	0.32		
	43-60	30-36	1.55-1.70	0.2-0.6	0.14-0.16	5.1-7.3	Moderate-----	0.32		
993D3:										
Gara------------	0-4	27-35	1.50-1.55	0.2-0.6	0.16-0.18	5.6-7.3	Moderate-----	0.28	4	6
	4-36	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-6.5	Moderate-----	0.28		
	36-60	24-38	1.65-1.75	0.2-0.6	0.16-0.18	5.6-8.4	Moderate-----	0.37		
Armstrong--------	0-5	35-42	1.45-1.50	0.2-0.6	0.18-0.20	5.1-7.3	Moderate-----	0.32	2	4
	5-36	36-60	1.45-1.55	0.06-0.2	0.11-0.16	4.5-6.5	High----------	0.32		
	36-60	30-36	1.55-1.70	0.2-0.6	0.14-0.16	5.1-7.3	Moderate-----	0.32		
994E2:										
Douds-----------	0-10	20-27	1.45-1.50	0.6-2.0	0.15-0.17	5.1-7.3	Low-----------	0.32	5	6
	10-48	26-35	1.45-1.65	0.6-2.0	0.15-0.17	4.5-6.0	Moderate-----	0.32		
	48-60	5-30	1.55-1.75	0.6-6.0	0.11-0.13	5.1-6.0	Low-----------	0.32		
Galland---------	0-10	22-27	1.45-1.50	0.6-2.0	0.19-0.21	5.6-7.3	Moderate-----	0.37	3	6
	10-46	35-48	1.45-1.65	0.06-0.2	0.14-0.19	4.5-6.0	High----------	0.37		
	46-60	10-45	1.55-1.75	0.6-6.0	0.11-0.13	6.1-6.5	Low-----------	0.24		
1130------------- Belinda	0-9	16-22	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	3	6
	9-17	18-27	1.30-1.35	0.6-2.0	0.20-0.22	4.5-6.0	Low-----------	0.37		
	17-51	42-52	1.30-1.45	<0.06	0.12-0.14	4.5-5.5	High----------	0.28		
	51-60	28-40	1.40-1.50	0.06-0.6	0.18-0.20	5.1-6.0	High----------	0.28		
1139------------- Perks Variant	0-7	2-10	1.50-1.55	6.0-20	0.07-0.09	5.6-7.3	Low-----------	0.15	5	1
	7-26	5-18	1.50-1.60	2.0-6.0	0.13-0.18	5.6-7.3	Low-----------	0.20		
	26-60	18-30	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Moderate-----	0.37		
1260------------- Beckwith	0-7	16-22	1.35-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.37	3	6
	7-15	18-27	1.30-1.35	0.6-2.0	0.20-0.22	4.5-5.5	Low-----------	0.37		
	15-44	40-52	1.30-1.45	<0.06	0.12-0.14	4.5-6.0	High----------	0.28		
	44-60	28-40	1.40-1.50	0.2-0.6	0.18-0.20	5.6-6.5	High----------	0.37		

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cc	In/hr	In/in	pH				
1715:										
Nodaway----------	0-8	18-27	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Low----------	0.37	5	6
	8-60	18-28	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Moderate-----	0.37		
Lawson----------	0-9	10-27	1.20-1.55	0.6-2.0	0.22-0.24	6.1-7.8	Low----------	0.28	5	5
	9-35	10-30	1.20-1.55	0.6-2.0	0.18-0.22	6.1-7.8	Low----------	0.28		
	35-60	18-30	1.55-1.65	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.43		
Ackmore----------	0-9	25-27	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.37	5	6
	9-31	25-30	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.37		
	31-60	26-38	1.30-1.40	0.6-2.0	0.18-0.20	5.6-7.8	High---------	0.37		
1977------------- Richwood Variant	0-20	12-24	1.35-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.32	5	5
	20-50	18-24	1.40-1.50	0.6-2.0	0.17-0.19	5.6-7.3	Low----------	0.32		
	50-60	12-22	1.50-1.65	0.6-6.0	0.15-0.19	6.1-7.3	Low----------	0.32		
5010, 5020. Pits										
5021. Orthents										
5030. Pits										
5040. Orthents										

TABLE 17.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
13B:												
Olmitz	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Vesser	C	Rare	---	---	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
Zook	C/D	Frequent	Brief to long.	Feb-Nov	0-3.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
24D2, 24E2 Shelby	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
51, 51+ Vesser	C	Occasional	Brief	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
51B, 51B+ Vesser	C	Rare	---	---	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
54, 54+ Zook	C/D	Occasional	Brief to long.	Feb-Nov	0-3.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
56B Cantril	B	None	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High	Moderate	Low.
58D2 Douds	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	>60	---	Moderate	Moderate	Moderate.
65E, 65E2, 65F, 65F2 Lindley	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
80B, 80C, 80C2, 80D2 Clinton	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
93D2:												
Adair	C	None	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High	High	Moderate.
Shelby	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
94E2:												
Caleb	B	None	---	---	3.0-5.0	Perched	Nov-Jul	>60	---	Moderate	Moderate	Moderate.
Mystic	C	None	---	---	3.0-5.0	Perched	Nov-Jul	>60	---	High	Moderate	Moderate.
130 Belinda	D	None	---	---	0.5-2.0	Apparent	Nov-Jul	>60	---	Moderate	High	Moderate.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
131B, 131C2--------- Pershing	C	None---------	---	---	2.0-4.0	Perched	Nov-Jul	>60	---	High------	High------	Moderate.
132B, 132C, 132C2- Weller	C	None---------	---	---	2.0-4.0	Perched	Nov-Jul	>60	---	High------	High------	High.
179D2, 179E, 179E2, 179E3, 179F, 179F2, 179F3------------ Gara	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
192C2, 192D2------- Adair	C	None---------	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High------	High------	Moderate.
211---------------- Edina	D	None---------	---	---	0.5-2.0	Perched	Nov-Jul	>60	---	Moderate	High------	Moderate.
222C2, 222C3------- Clarinda	D	None---------	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High------	High------	Moderate.
223C2, 223C3------- Rinda	D	None---------	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High------	High------	Moderate.
260---------------- Beckwith	D	None---------	---	---	+1-1.0	Perched	Nov-Jul	>60	---	Moderate	High------	Moderate.
261---------------- Appanoose	D	None---------	---	---	0-1.0	Apparent	Nov-Jul	>60	---	Moderate	High------	Moderate.
263---------------- Okaw	D	Rare---------	---	---	+.5-1.0	Apparent	Nov-Jul	>60	---	High------	High------	High.
269---------------- Humeston	C/D	Occasional	Very brief	Feb-Nov	0-1.0	Apparent	Nov-Jul	>60	---	High------	High------	Moderate.
273B--------------- Olmitz	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
312B, 312B2-------- Seymour	D	None---------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	Moderate	High------	Moderate.
313E2, 313G, 313G2------------ Gosport	C	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	High------	High.
362---------------- Haig	C/D	None---------	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	High------	High------	Moderate.
364B--------------- Grundy	C	None---------	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High------	High------	Moderate.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
405 Floris	B	Frequent	Very brief to brief.	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	Moderate	Low	Moderate.
423D2, 423D3 Bucknell	D	None	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	Moderate	High	Moderate.
424D2, 424E2:												
Lindley	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Keswick	C	None	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High	High	Moderate.
425C, 425C2, 425D, 425D2, 425D3 Keswick	C	None	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High	High	Moderate.
430 Ackmore	B	Occasional	Very brief to brief.	Sep-Jun	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Low.
451D2 Caleb	B	None	---	---	3.0-5.0	Perched	Nov-Jul	>60	---	Moderate	Moderate	Moderate.
452C2 Lineville	C	None	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High	High	Moderate.
453 Tuskeego	C/D	Rare	---	---	0-1.0	Apparent	Nov-Jul	>60	---	Moderate	High	Moderate.
484 Lawson	C	Occasional	Brief to long.	Mar-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High	Moderate	Low.
520 Coppock	B	Occasional	Brief	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
520B Coppock	B	Rare	---	---	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
531B, 531C, 531C2 Kniffin	D	None	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	Moderate	High	Moderate.
532B, 532C, 532C2 Rathbun	D	None	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	Moderate	High	Moderate.
587 Chequest	C	Occasional	Long	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
592C2, 592D2, 592D3 Mystic	C	None	---	---	3.0-5.0	Perched	Nov-Jul	>60	---	High	Moderate	Moderate.
594C2, 594D2 Galland	D	None	---	---	3.0-5.0	Perched	Nov-Jul	>60	---	High	High	Moderate.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
715:												
Nodaway----------	B	Occasional	Very brief to brief.	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	High-----	Moderate	Low.
Amana------------	B	Occasional	Brief-----	Feb-Nov	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
730B:												
Nodaway----------	B	Occasional	Very brief to brief.	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	High-----	Moderate	Low.
Cantril----------	B	None---------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	Moderate	Low.
792C, 792C2, 792C3, 792D, 792D2, 792D3----- Armstrong	C	None---------	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High-----	High-----	Moderate.
795D2------------- Ashgrove	D	None---------	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High-----	High-----	Moderate.
822D2------------- Lamoni	C	None---------	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	Moderate	High-----	Moderate.
831B, 831C2------- Pershing	C	None---------	---	---	2.0-4.0	Perched	Nov-Jul	>60	---	High-----	High-----	Moderate.
832B, 832C2------- Weller	C	None---------	---	---	2.0-4.0	Perched	Nov-Jul	>60	---	High-----	High-----	High.
993D2, 993D3:												
Gara-------------	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Armstrong--------	C	None---------	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High-----	High-----	Moderate.
994E2:												
Douds------------	B	None---------	---	---	4.0-6.0	Apparent	Nov-Jul	>60	---	Moderate	Moderate	Moderate.
Galland----------	D	None---------	---	---	3.0-5.0	Perched	Nov-Jul	>60	---	High-----	High-----	Moderate.
1130-------------- Belinda	D	None---------	---	---	0.5-2.0	Apparent	Nov-Jul	>60	---	Moderate	High-----	Moderate.
1139-------------- Perks Variant	A	Frequent----	Very brief to brief.	Feb-Nov	3.0-5.0	Perched	Nov-Jul	>60	---	Moderate	Low------	Moderate.
1260-------------- Beckwith	D	None---------	---	---	+1-1.0	Perched	Nov-Jul	>60	---	Moderate	High-----	Moderate.
1715:												
Nodaway----------	B	Occasional	Very brief to brief.	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	High-----	Moderate	Low.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
1715:												
Lawson-----------	C	Occasional	Brief to long.	Mar-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High-----	Moderate	Low.
Ackmore----------	B	Occasional	Very brief to brief.	Sep-Jun	1.0-3.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Low.
1977-------------- Richwood Variant	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
5010, 5020. Pits												
5021. Orthents												
5030. Pits												
5040. Orthents												

TABLE 18.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Ackmore	Fine-silty, mixed, nonacid, mesic Aeric Fluvaquents
*Adair	Fine, montmorillonitic, mesic Aquic Argiudolls
Amana	Fine-silty, mixed, mesic Aquic Hapludolls
Appanoose	Fine, montmorillonitic, mesic Mollic Albaqualfs
Armstrong	Fine, montmorillonitic, mesic Aquollic Hapludalfs
Ashgrove	Fine, montmorillonitic, mesic, sloping Aeric Ochraqualfs
Beckwith	Fine, montmorillonitic, mesic Typic Albaqualfs
Belinda	Fine, montmorillonitic, mesic Mollic Albaqualfs
Bucknell	Fine, montmorillonitic, mesic, sloping Udollic Ochraqualfs
Caleb	Fine-loamy, mixed, mesic Mollic Hapludalfs
Cantril	Fine-loamy, mixed, mesic Udollic Ochraqualfs
Chequest	Fine, montmorillonitic, mesic Typic Haplaquolls
*Clarinda	Fine, montmorillonitic, mesic, sloping Typic Argiaquolls
Clinton	Fine, montmorillonitic, mesic Typic Hapludalfs
Coppock	Fine-silty, mixed, mesic Mollic Ochraqualfs
Douds	Fine-loamy, mixed, mesic Typic Hapludalfs
Edina	Fine, montmorillonitic, mesic Typic Argialbolls
Floris	Coarse-loamy, mixed, nonacid, mesic Typic Udifluvents
Galland	Fine, montmorillonitic, mesic Aquic Hapludalfs
Gara	Fine-loamy, mixed, mesic Mollic Hapludalfs
Gosport	Fine, illitic, mesic Typic Dystrochrepts
Grundy	Fine, montmorillonitic, mesic Aquic Argiudolls
Haig	Fine, montmorillonitic, mesic Typic Argiaquolls
Humeston	Fine, montmorillonitic, mesic Argiaquic Argialbolls
Keswick	Fine, montmorillonitic, mesic Aquic Hapludalfs
Kniffin	Fine, montmorillonitic, mesic Udollic Ochraqualfs
*Lamoni	Fine, montmorillonitic, mesic Aquic Argiudolls
Lawson	Fine-silty, mixed, mesic Cumulic Hapludolls
Lindley	Fine-loamy, mixed, mesic Typic Hapludalfs
Lineville	Fine-loamy, mixed, mesic Aquollic Hapludalfs
Mystic	Fine, montmorillonitic, mesic Aquollic Hapludalfs
Nodaway	Fine-silty, mixed, nonacid, mesic Mollic Udifluvents
Okaw	Fine, montmorillonitic, mesic Typic Albaqualfs
Olmitz	Fine-loamy, mixed, mesic Cumulic Hapludolls
Perks Variant	Sandy over loamy, mixed, mesic Typic Udifluvents
Pershing	Fine, montmorillonitic, mesic Aquollic Hapludalfs
Rathbun	Fine, montmorillonitic, mesic Aeric Ochraqualfs
Richwood Variant	Fine-loamy, mixed, mesic Typic Argiudolls
Rinda	Fine, montmorillonitic, mesic, sloping Mollic Ochraqualfs
Seymour	Fine, montmorillonitic, mesic Aquic Argiudolls
*Shelby	Fine-loamy, mixed, mesic Typic Argiudolls
Tuskeego	Fine, montmorillonitic, mesic Mollic Ochraqualfs
Vesser	Fine-silty, mixed, mesic Argiaquic Argialbolls
Weller	Fine, montmorillonitic, mesic Aquic Hapludalfs
Zook	Fine, montmorillonitic, mesic Cumulic Haplaquolls

U.S. GOVERNMENT PRINTING OFFICE: 1991-281-364/40012

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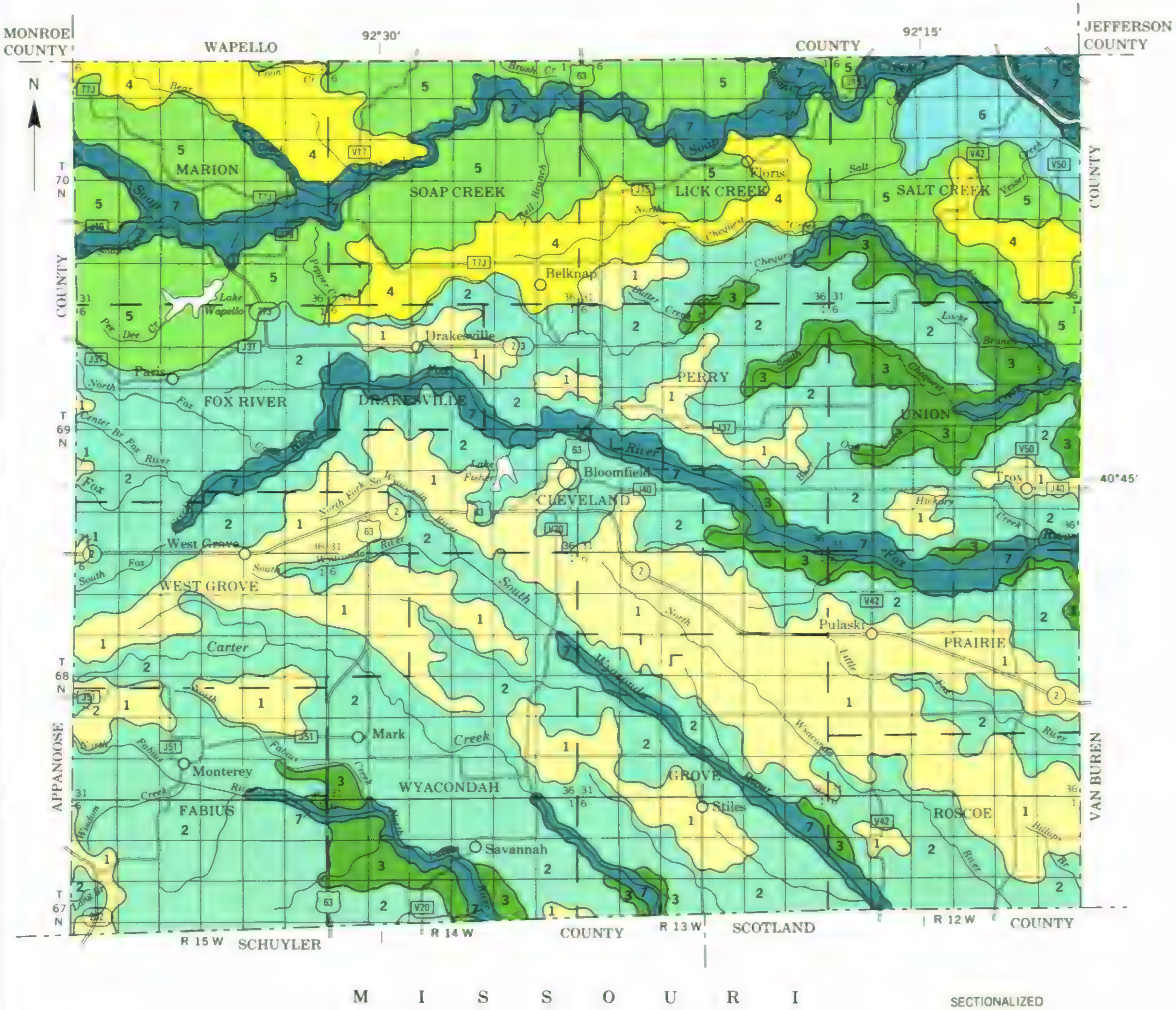


LEGEND *

1. **EDINA-SEYMOUR-CLARINDA ASSOCIATION:** Nearly level to moderately sloping, poorly drained and somewhat poorly drained, silty soils that formed in loess and a paleosol weathered from glacial till; on uplands
2. **ARMSTRONG-GARA-KNIFFIN ASSOCIATION:** Gently sloping to steep, somewhat poorly drained to well drained, loamy and silty soils that formed in a paleosol weathered from glacial till and in glacial till and loess; on uplands
3. **LINDLEY-KESWICK-RATHBUN ASSOCIATION:** Gently sloping to very steep, well drained to somewhat poorly drained, loamy and silty soils that formed in glacial till, a paleosol weathered from glacial till, and loess; on uplands
4. **GARA-ARMSTRONG-PERSHING ASSOCIATION:** Gently sloping to steep, well drained to somewhat poorly drained, loamy and silty soils that formed in glacial till, a paleosol weathered from glacial till, and loess; on uplands
5. **LINDLEY-KESWICK-WELLER ASSOCIATION:** Gently sloping to very steep, well drained and moderately well drained, loamy and silty soils that formed in glacial till, a paleosol weathered from glacial till, and loess; on uplands
6. **LINDLEY-CLINTON ASSOCIATION:** Gently sloping to very steep, well drained and moderately well drained, loamy and silty soils that formed in glacial till and loess; on uplands
7. **NODAWAY-VESSER-ZOOK ASSOCIATION:** Nearly level to gently sloping, moderately well drained and poorly drained, silty soils that formed in alluvium; on bottomland

* The texture terms in the descriptive headings refer to the surface layer of the major soils of each association.

Compiled 1988

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
IOWA AGRICULTURE AND HOME ECONOMICS EXPERIMENT STATION
COOPERATIVE EXTENSION SERVICE, IOWA STATE UNIVERSITY
DIVISION OF SOIL CONSERVATION
IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP

GENERAL SOIL MAP
DAVIS COUNTY, IOWA

Scale 1:190,080

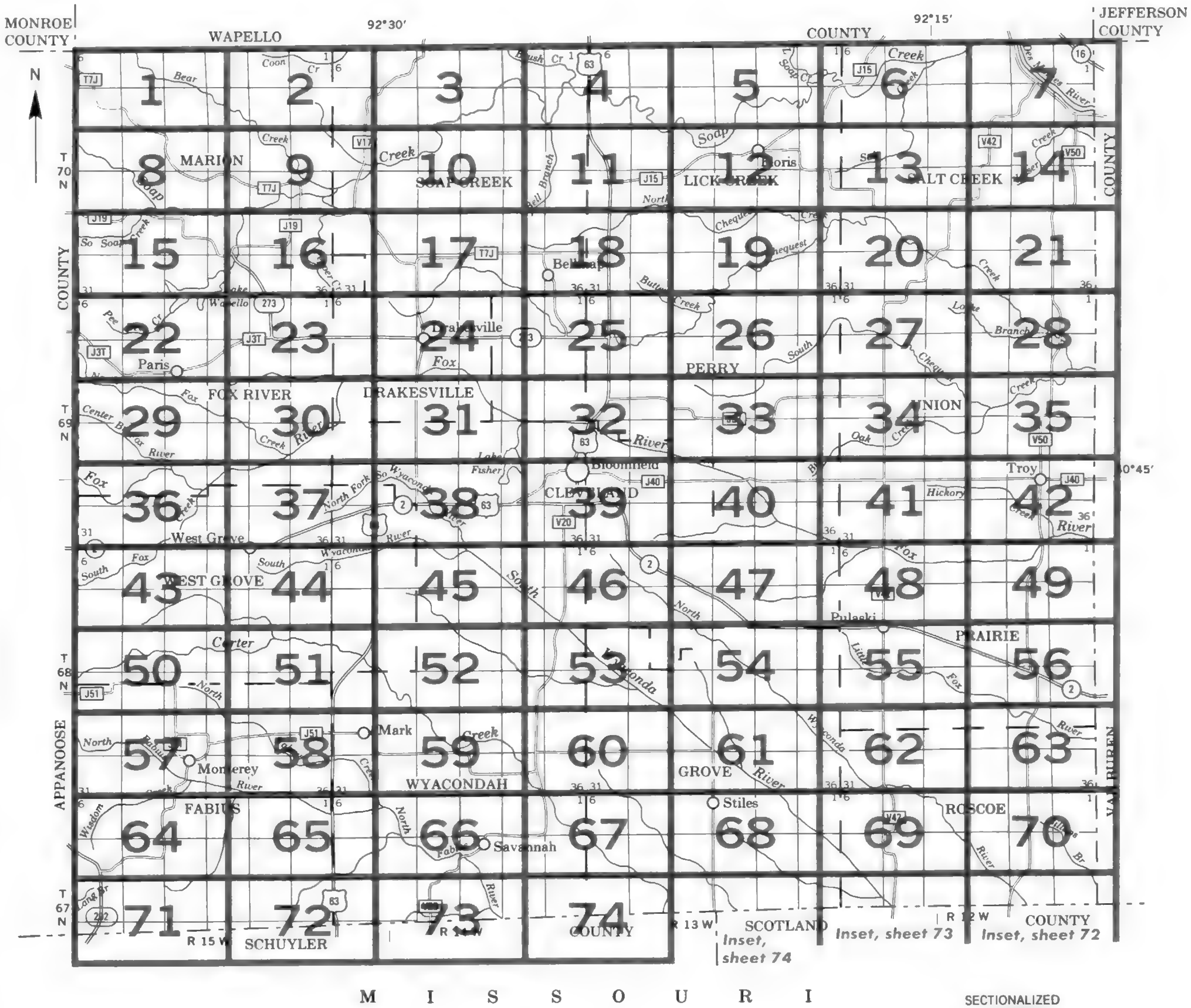
1 0 1 2 3 Mi

1 0 3 6 Km

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS

DAVIS COUNTY, IOWA

Scale 1:190,080

1 0 1 2 3 Mi

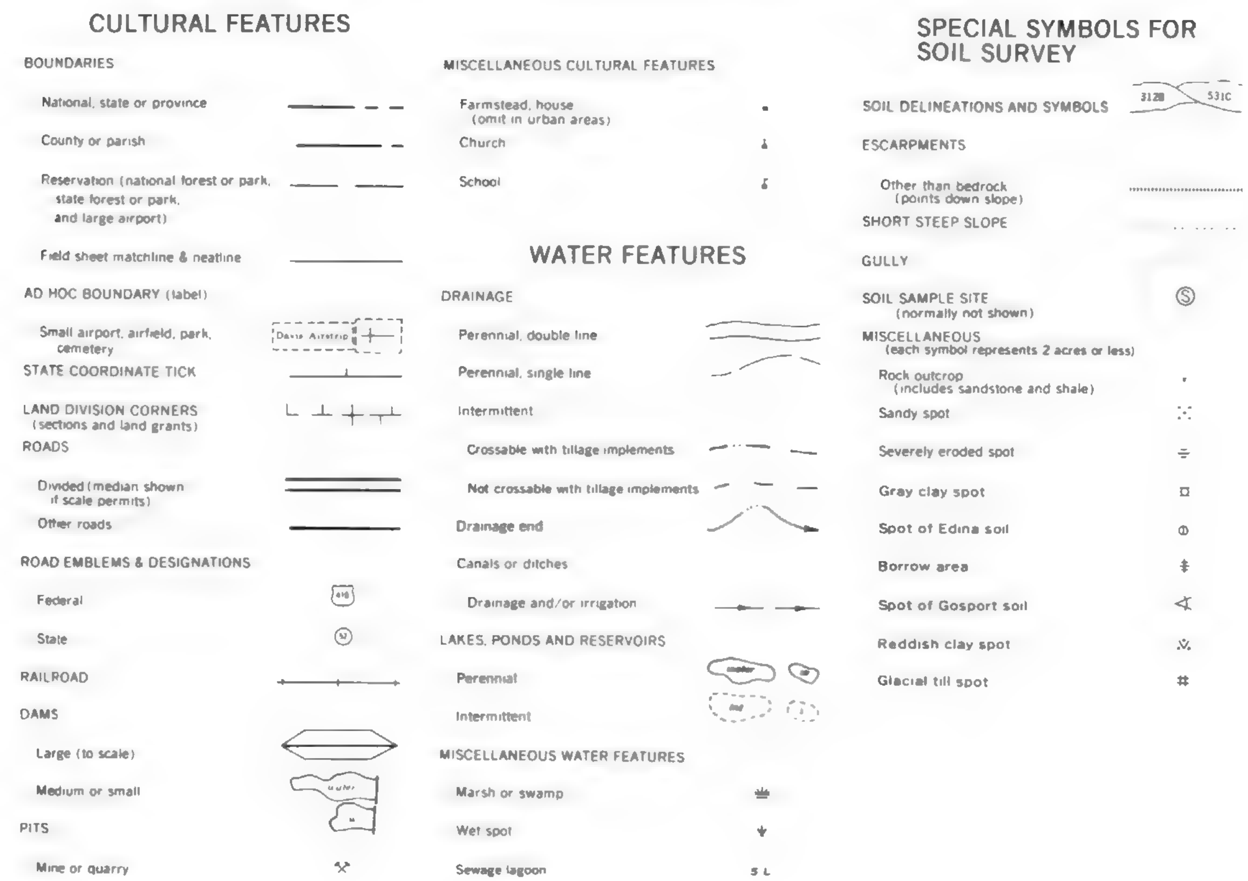
1 0 3 6 Km

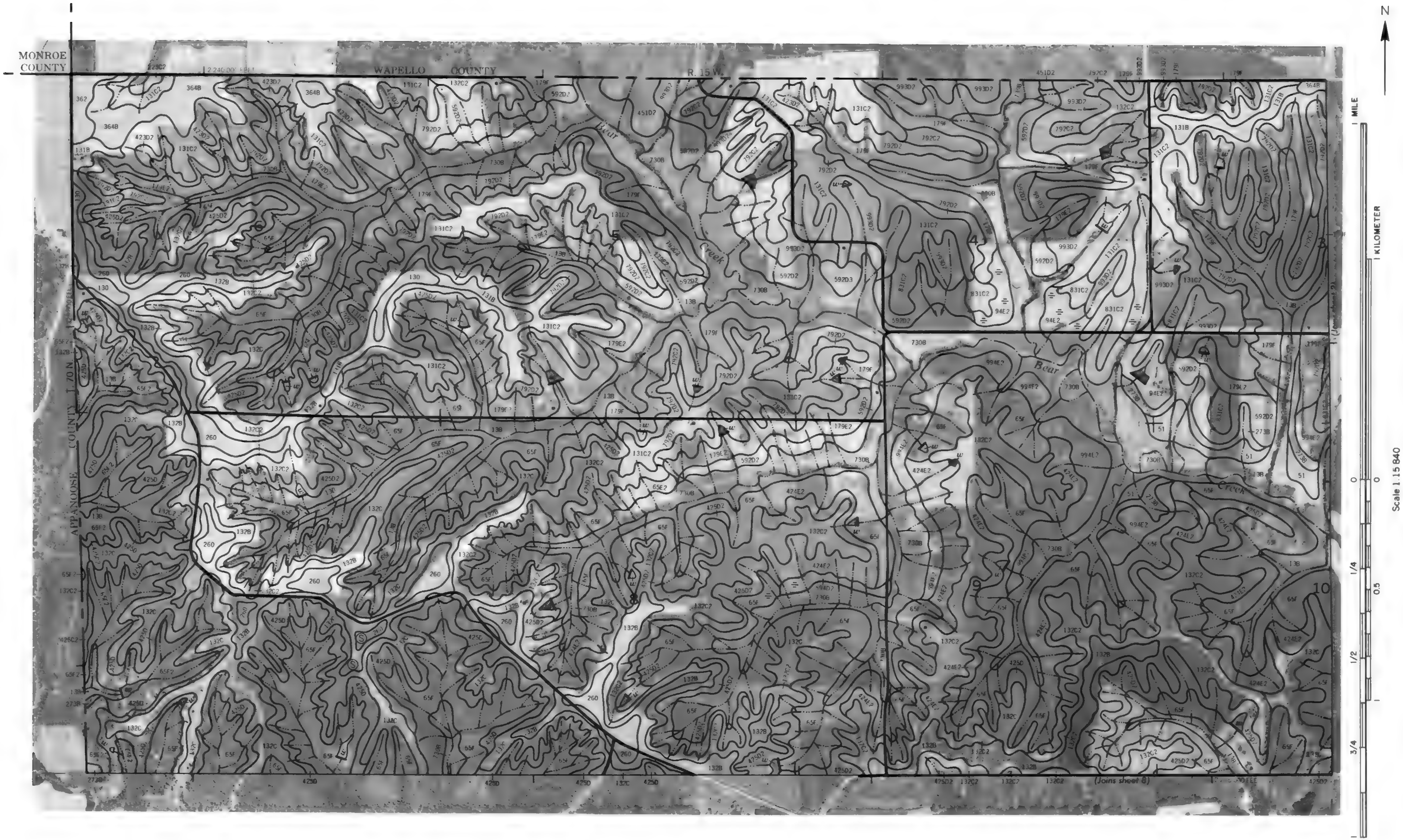
SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and a letter. The initial numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 following the slope letter indicates that the soil is moderately eroded and 3 indicates that the soil is severely eroded.

SYMBOL	NAME
13B	Olmitz-Vesser-Zook complex, 0 to 5 percent slopes
24D2	Shelby loam, 9 to 14 percent slopes, moderately eroded
24E2	Shelby loam, 14 to 18 percent slopes, moderately eroded
51	Vesser silt loam, 0 to 2 percent slopes
51+	Vesser silt loam, overwash, 0 to 2 percent slopes
51B	Vesser silt loam, 2 to 5 percent slopes
51B+	Vesser silt loam, overwash, 2 to 5 percent slopes
54	Zook silty clay loam, 0 to 2 percent slopes
54+	Zook silt loam, overwash, 0 to 2 percent slopes
56B	Cantril loam, 2 to 5 percent slopes
58D2	Douds loam, 9 to 14 percent slopes, moderately eroded
65E	Lindley loam, 14 to 18 percent slopes
65E2	Lindley loam, 14 to 18 percent slopes, moderately eroded
65F	Lindley loam, 18 to 40 percent slopes
65F2	Lindley loam, 18 to 25 percent slopes, moderately eroded
80B	Clinton silt loam, 2 to 5 percent slopes
80C	Clinton silt loam, 5 to 9 percent slopes
80C2	Clinton silt loam, 5 to 9 percent slopes, moderately eroded
80D2	Clinton silt loam, 9 to 14 percent slopes, moderately eroded
93D2	Adair-Shelby complex, 9 to 14 percent slopes, moderately eroded
94E2	Caleb-Mystic complex, 14 to 18 percent slopes, moderately eroded
130	Belinda silt loam, 0 to 2 percent slopes
131B	Pershing silt loam, 2 to 5 percent slopes
131C2	Pershing silty clay loam, 5 to 9 percent slopes, moderately eroded
132B	Weller silt loam, 2 to 5 percent slopes
132C	Weller silt loam, 5 to 9 percent slopes
132C2	Weller silty clay loam, 5 to 9 percent slopes, moderately eroded
179D2	Gara loam, 9 to 14 percent slopes, moderately eroded
179E	Gara loam, 14 to 18 percent slopes
179E2	Gara loam, 14 to 18 percent slopes, moderately eroded
179E3	Gara clay loam, 14 to 18 percent slopes, severely eroded
179F	Gara loam, 18 to 25 percent slopes
179F2	Gara loam, 18 to 25 percent slopes, moderately eroded
179F3	Gara clay loam, 18 to 25 percent slopes, severely eroded
192C2	Adair clay loam, 5 to 9 percent slopes, moderately eroded
192D2	Adair clay loam, 9 to 14 percent slopes, moderately eroded
211	Edina silt loam, 0 to 1 percent slopes
222C2	Clarinda silty clay loam, 5 to 9 percent slopes, moderately eroded
222C3	Clarinda silty clay loam, 5 to 9 percent slopes, severely eroded
223C2	Rinda silty clay loam, 5 to 9 percent slopes, moderately eroded
223C3	Rinda silty clay loam, 5 to 9 percent slopes, severely eroded
260	Beckwith silt loam, 0 to 2 percent slopes
261	Appanoose silt loam, 0 to 2 percent slopes
263	Okaw silt loam, 0 to 2 percent slopes
269	Humeston silt loam, 0 to 2 percent slopes
273B	Olmitz loam, 2 to 5 percent slopes
312B	Seymour silt loam, 2 to 5 percent slopes
312B2	Seymour silty clay loam, 2 to 5 percent slopes, moderately eroded
313E2	Gosport silt loam, 9 to 18 percent slopes, moderately eroded
313G	Gosport silt loam, 18 to 40 percent slopes
313G2	Gosport silt loam, 18 to 40 percent slopes, moderately eroded
362	Haig silt loam, 0 to 2 percent slopes
364B	Grundy silt loam, 2 to 5 percent slopes
405	Floris silt loam, 0 to 2 percent slopes
423D2	Bucknell silty clay loam, 9 to 14 percent slopes, moderately eroded
423D3	Bucknell silty clay loam, 9 to 14 percent slopes, severely eroded
424D2	Lindley-Keswick loams, 9 to 14 percent slopes, moderately eroded
424E2	Lindley-Keswick loams, 14 to 18 percent slopes, moderately eroded
425C	Keswick loam, 5 to 9 percent slopes
425C2	Keswick loam, 5 to 9 percent slopes, moderately eroded
425D	Keswick loam, 9 to 14 percent slopes
425D2	Keswick loam, 9 to 14 percent slopes, moderately eroded
425D3	Keswick clay loam, 9 to 14 percent slopes, severely eroded
430	Ackmore silt loam, 0 to 2 percent slopes
451D2	Caleb loam, 9 to 14 percent slopes, moderately eroded
452C2	Lineville silt loam, 5 to 9 percent slopes, moderately eroded
453	Tuskeego silt loam, 0 to 2 percent slopes
484	Lawson silt loam, 0 to 2 percent slopes
520	Coppock silt loam, 0 to 2 percent slopes
520B	Coppock silt loam, 2 to 5 percent slopes
531B	Kniffin silt loam, 2 to 5 percent slopes
531C	Kniffin silt loam, 5 to 9 percent slopes
531C2	Kniffin silty clay loam, 5 to 9 percent slopes, moderately eroded
532B	Rathbun silt loam, 2 to 5 percent slopes
532C	Rathbun silt loam, 5 to 9 percent slopes
532C2	Rathbun silty clay loam, 5 to 9 percent slopes, moderately eroded
587	Chequest silty clay loam, 0 to 2 percent slopes
592C2	Mystic silt loam, 5 to 9 percent slopes, moderately eroded
592D2	Mystic silt loam, 9 to 14 percent slopes, moderately eroded
592D3	Mystic clay loam, 9 to 14 percent slopes, severely eroded
594C2	Galland loam, 5 to 9 percent slopes, moderately eroded
594D2	Galland loam, 9 to 14 percent slopes, moderately eroded
715	Nodaway-Amana silt loams, 0 to 2 percent slopes
730B	Nodaway-Cantril complex, 0 to 5 percent slopes
792C	Armstrong loam, 5 to 9 percent slopes
792C2	Armstrong loam, 5 to 9 percent slopes, moderately eroded
792C3	Armstrong clay loam, 5 to 9 percent slopes, severely eroded
792D	Armstrong loam, 9 to 14 percent slopes
792D2	Armstrong loam, 9 to 14 percent slopes, moderately eroded
792D3	Armstrong clay loam, 9 to 14 percent slopes, severely eroded
795D2	Ashgrove silty clay loam, 9 to 14 percent slopes, moderately eroded
822D2	Lamoni clay loam, 9 to 14 percent slopes, moderately eroded
831B	Pershing silt loam, benches, 2 to 5 percent slopes
831C2	Pershing silty clay loam, benches, 5 to 9 percent slopes, moderately eroded
832B	Weller silt loam, benches, 2 to 5 percent slopes
832C2	Weller silty clay loam, benches, 5 to 9 percent slopes, moderately eroded
993D2	Gara-Armstrong loams, 9 to 14 percent slopes, moderately eroded
993D3	Gara-Armstrong clay loams, 9 to 14 percent slopes, severely eroded
994E2	Douds-Galland loams, 14 to 18 percent slopes, moderately eroded
1130	Belinda silt loam, benches, 0 to 2 percent slopes
1139	Perks Vanant sand, 0 to 2 percent slopes
1260	Beckwith silt loam, benches, 0 to 2 percent slopes
1715	Nodaway-Lawson-Ackmore silt loams, 0 to 2 percent slopes
1977	Richwood Vanant loam, 1 to 3 percent slopes
5010	Pits, sand and gravel
5020	Pits and Dumps
5021	Orthents, hilly
5030	Pits, limestone quarries
5040	Orthents, loamy

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND





DAVIS COUNTY, IOWA NO. 1

This soil survey map is compiled on 1979 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 2

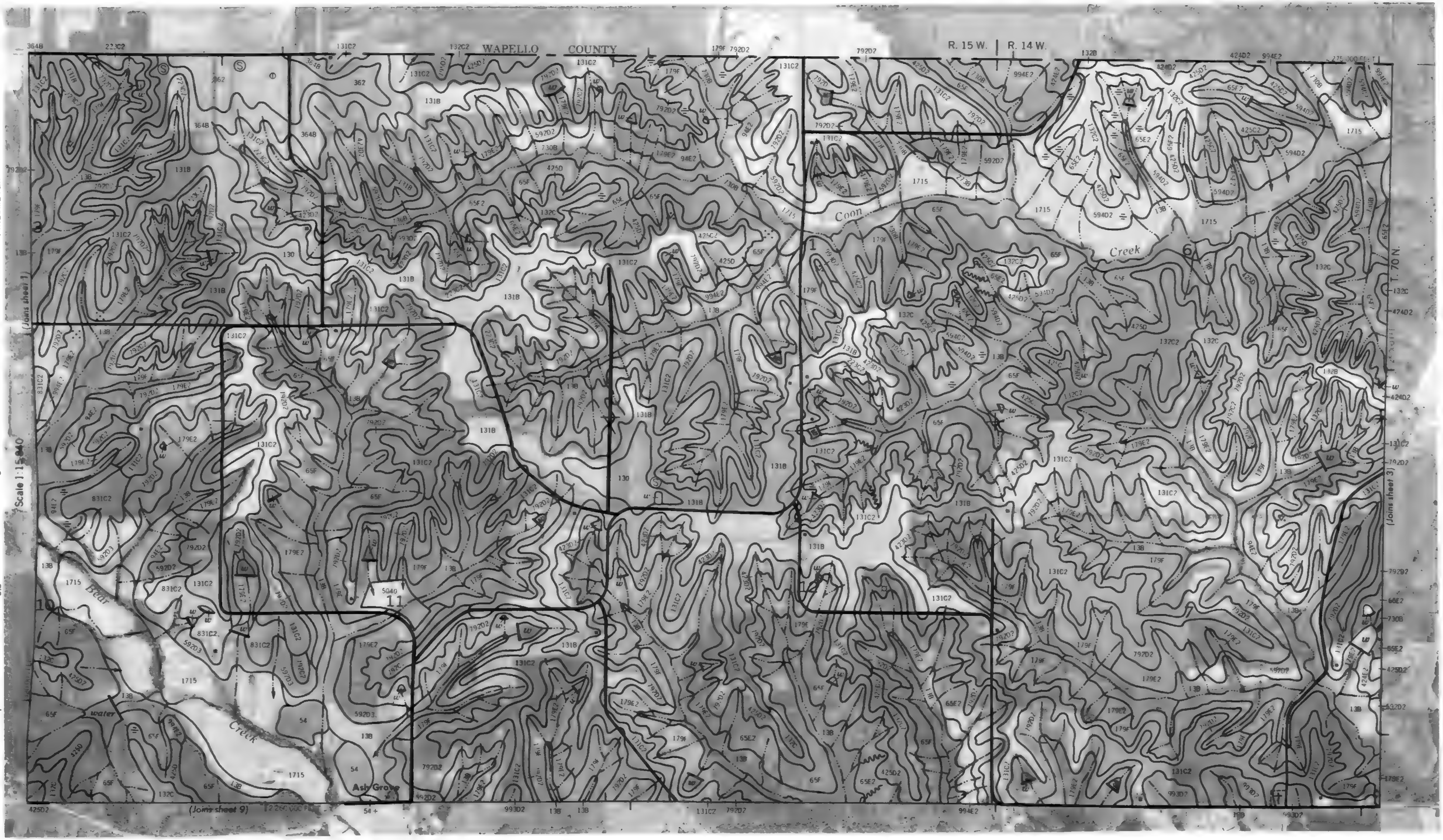
2

N

1 MILE

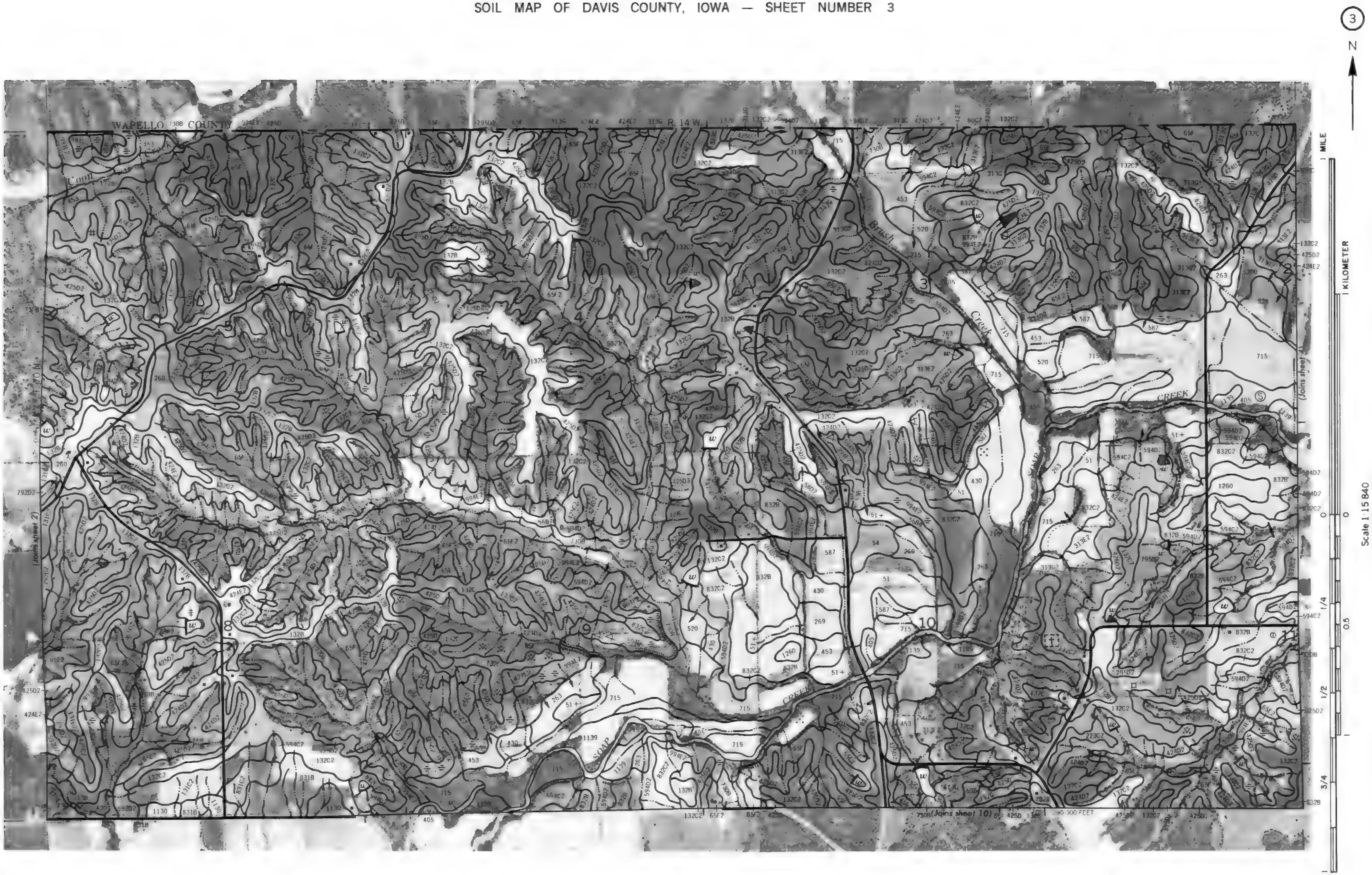
1 KILOMETER

Scale 1:15 840

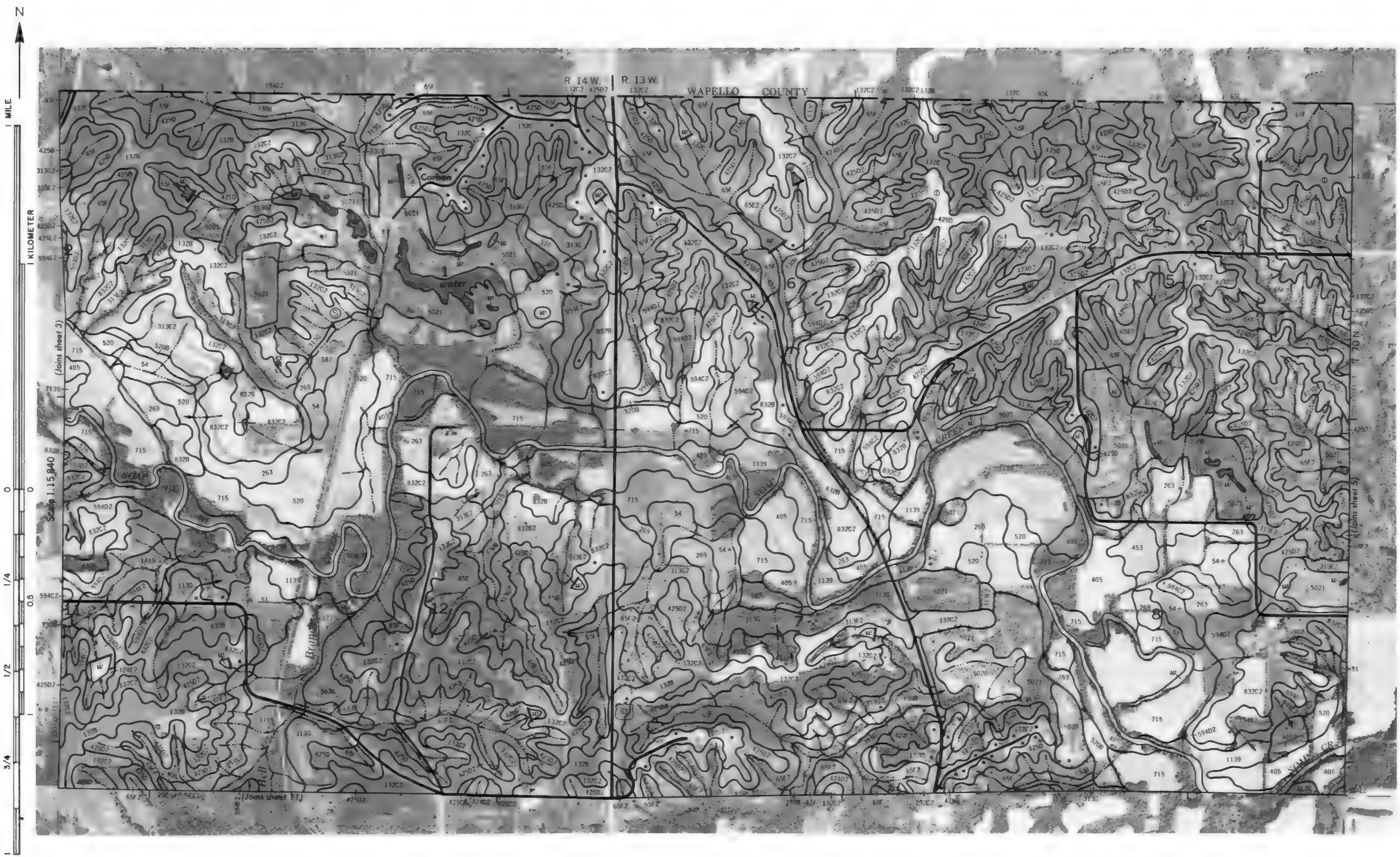


DAVIS COUNTY, IOWA NO 2

DAVIS COUNTY, IOWA NO. 3



SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 4

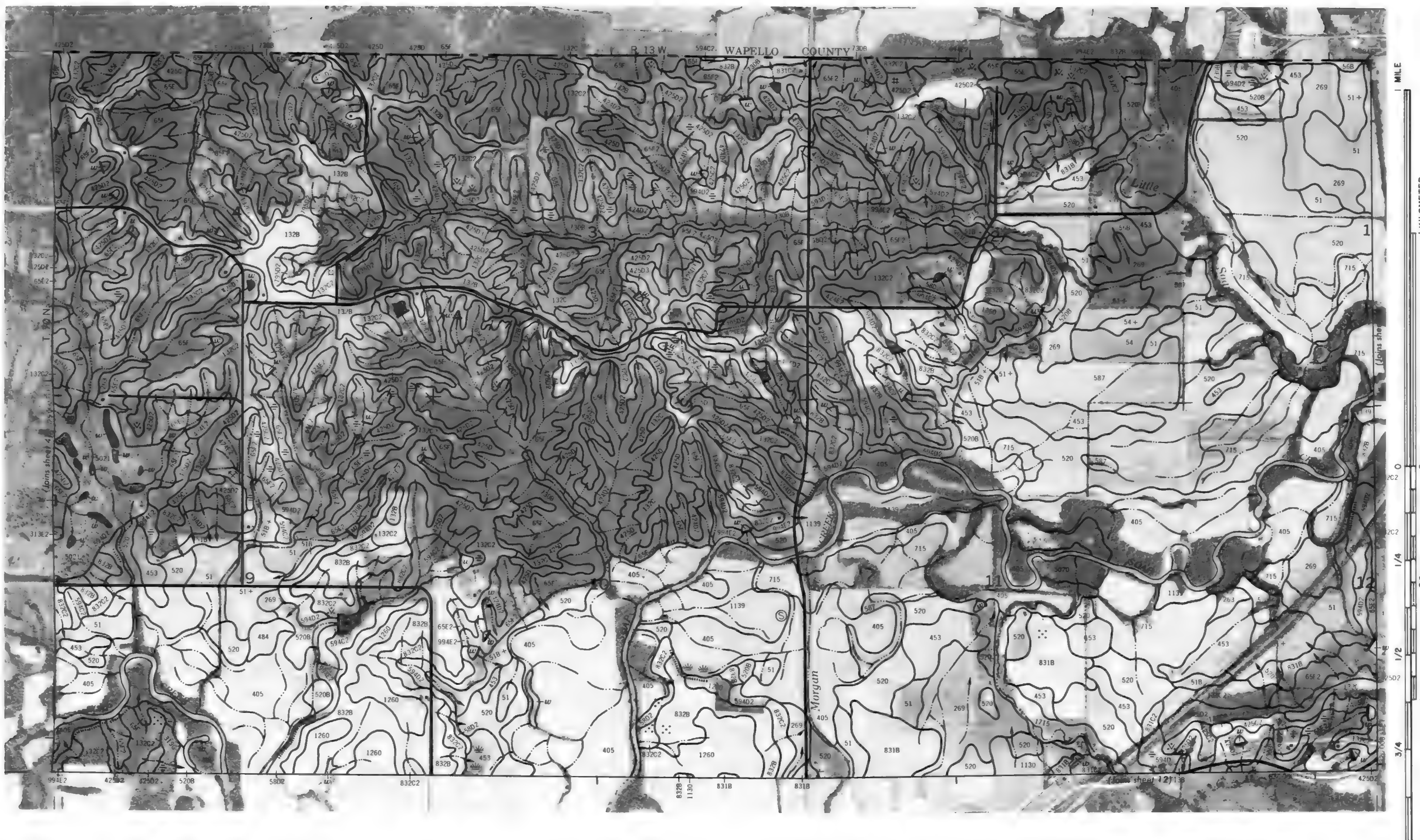


This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

DAVIS COUNTY, IOWA NO. 4

5

N



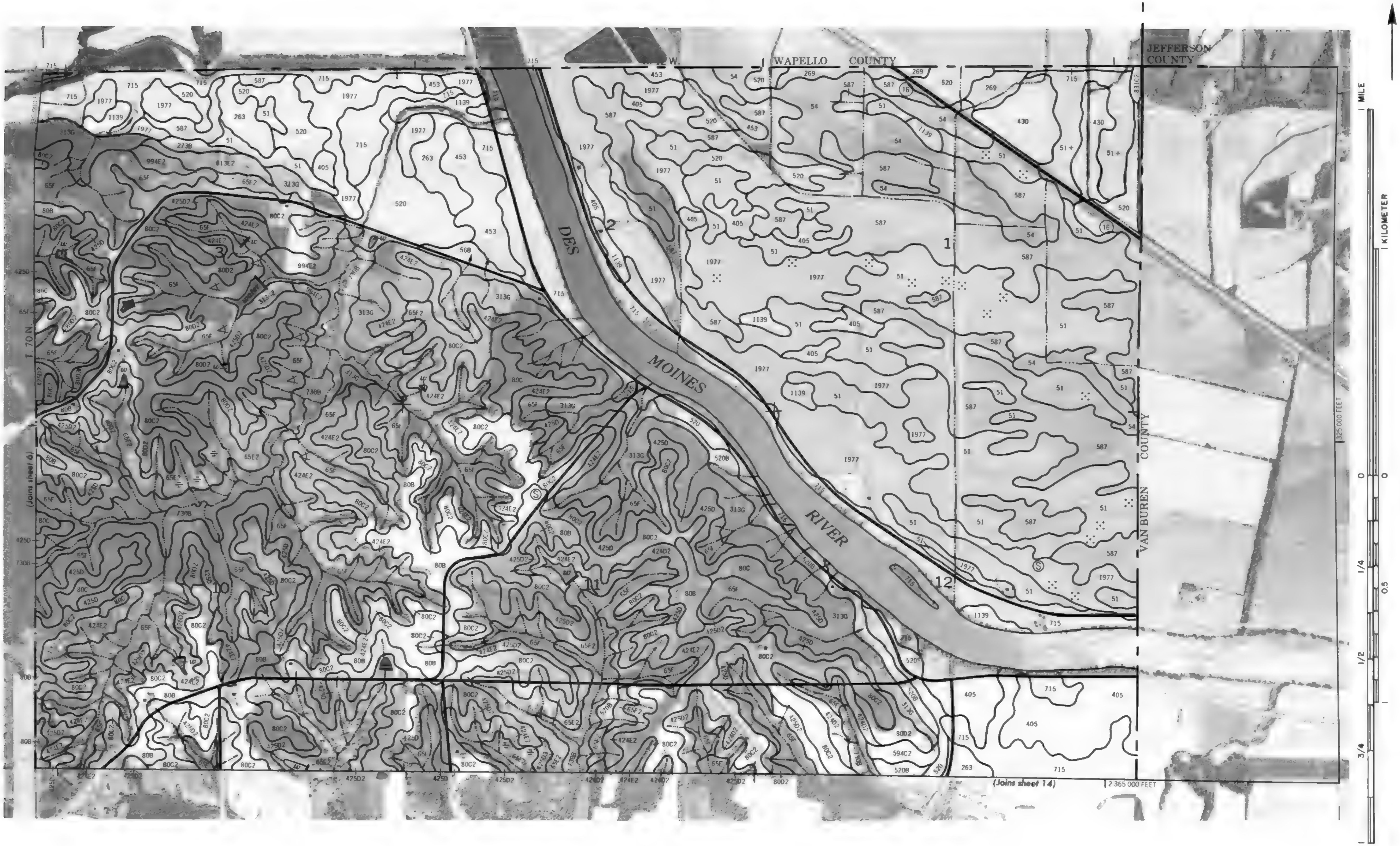
DAVIS COUNTY, IOWA NO. 5

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

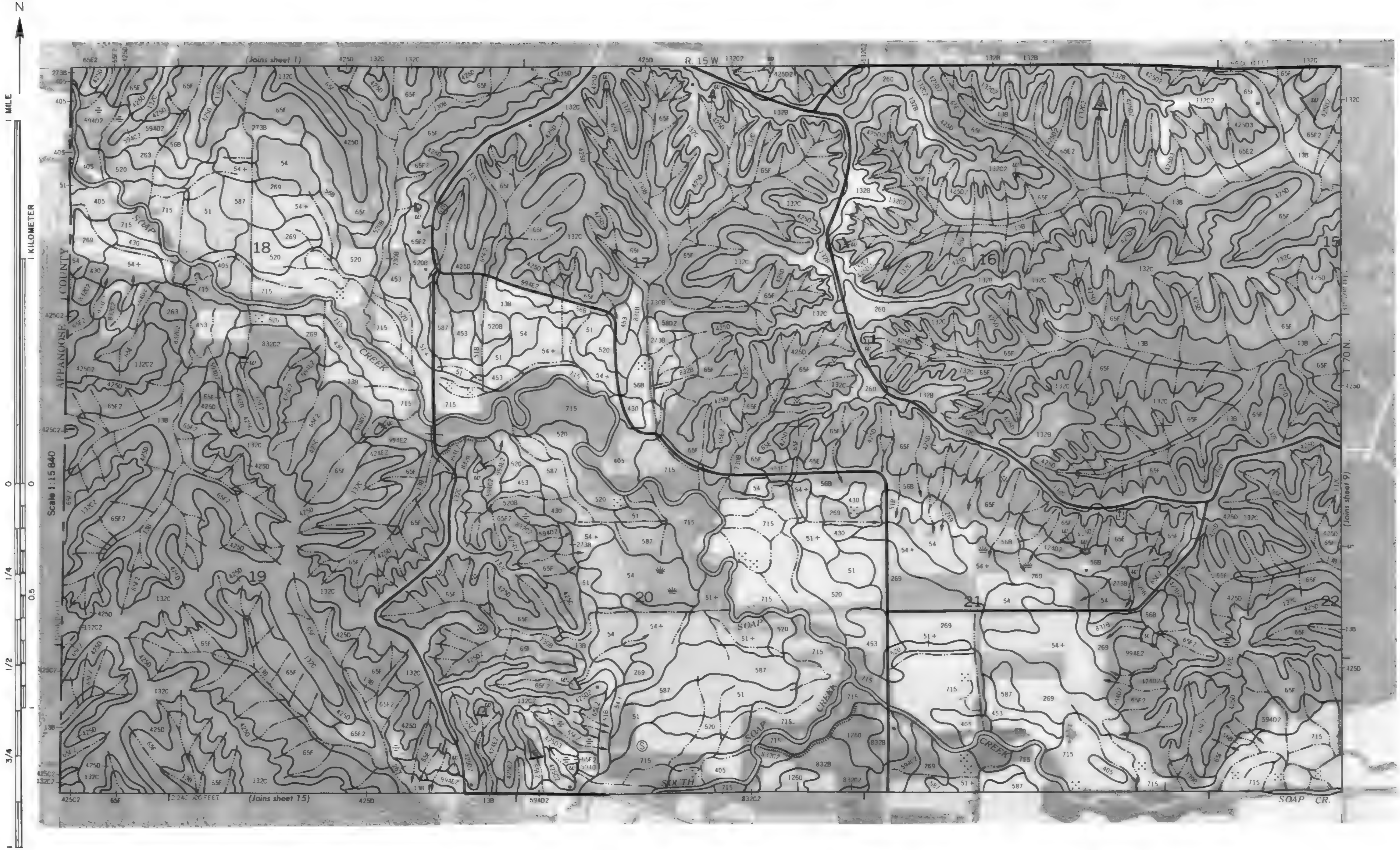
SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 6

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

DAVIS COUNTY, IOWA NO. 6



DAVIS COUNTY, IOWA NO. 7



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

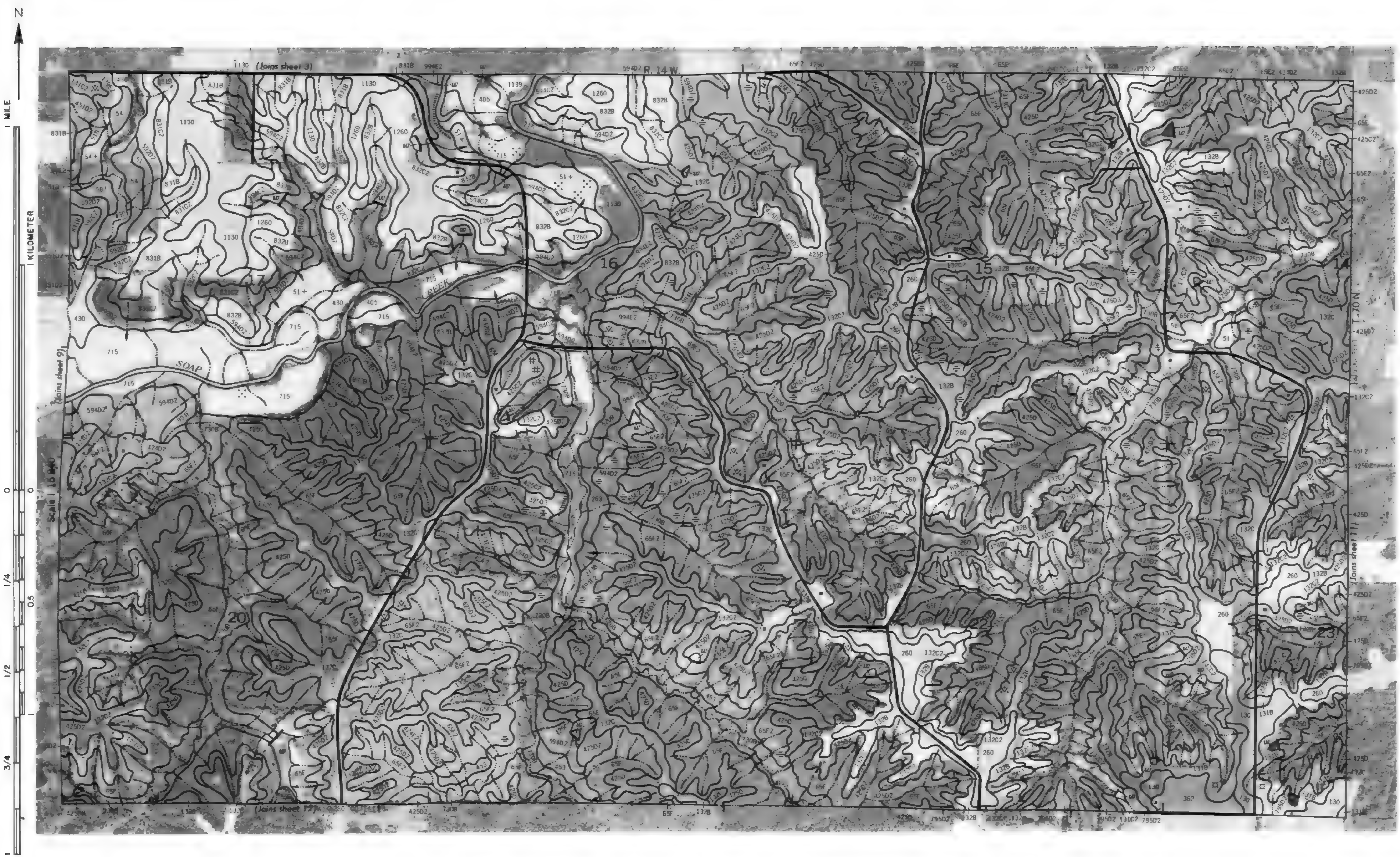
DAVIS COUNTY, IOWA NO. 8

9

DAVIS COUNTY, IOWA NO. 9

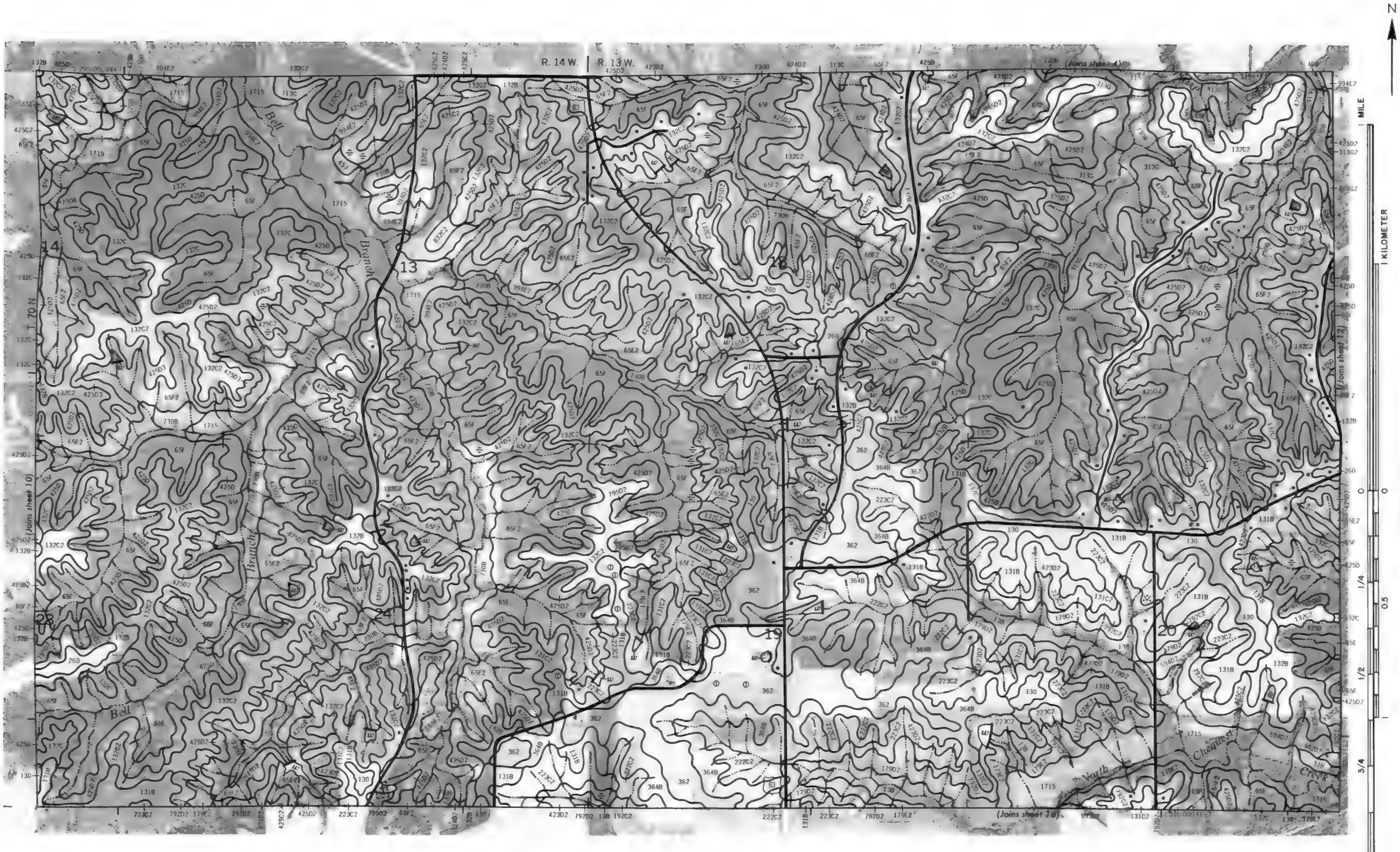
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 10



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

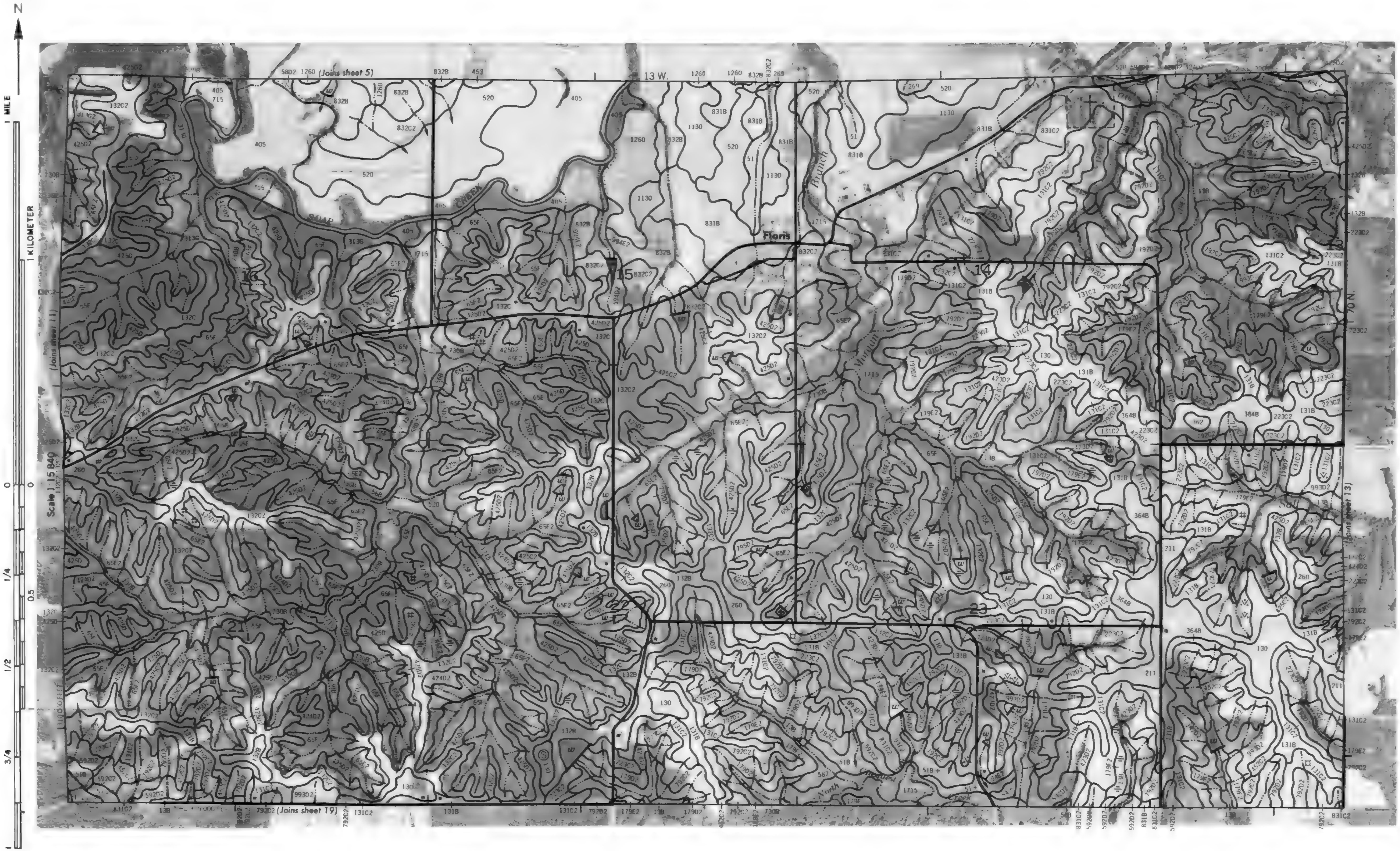
DAVIS COUNTY, IOWA NO. 10



DAVIS COUNTY, IOWA NO. 11

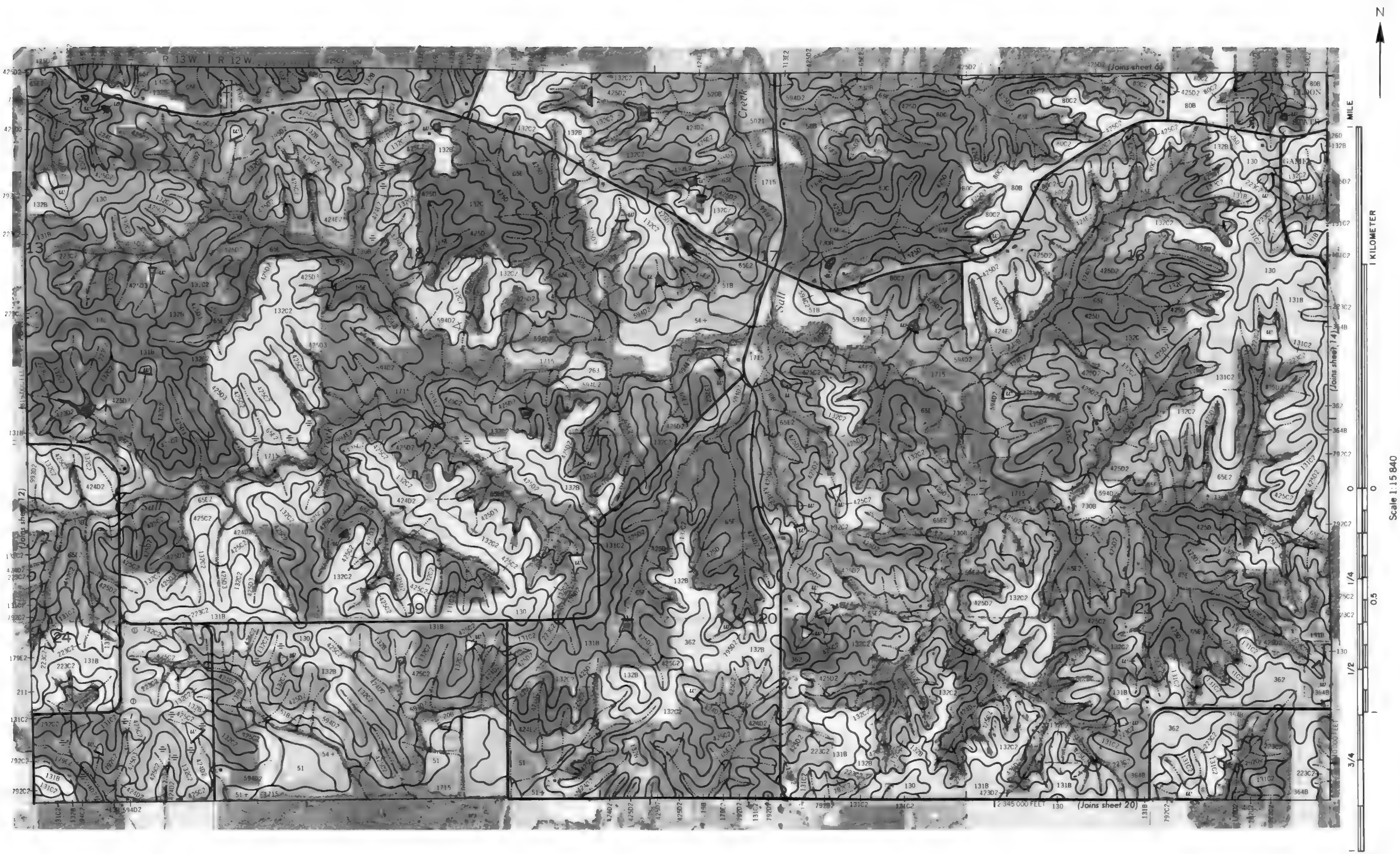
This soil survey map was compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 12



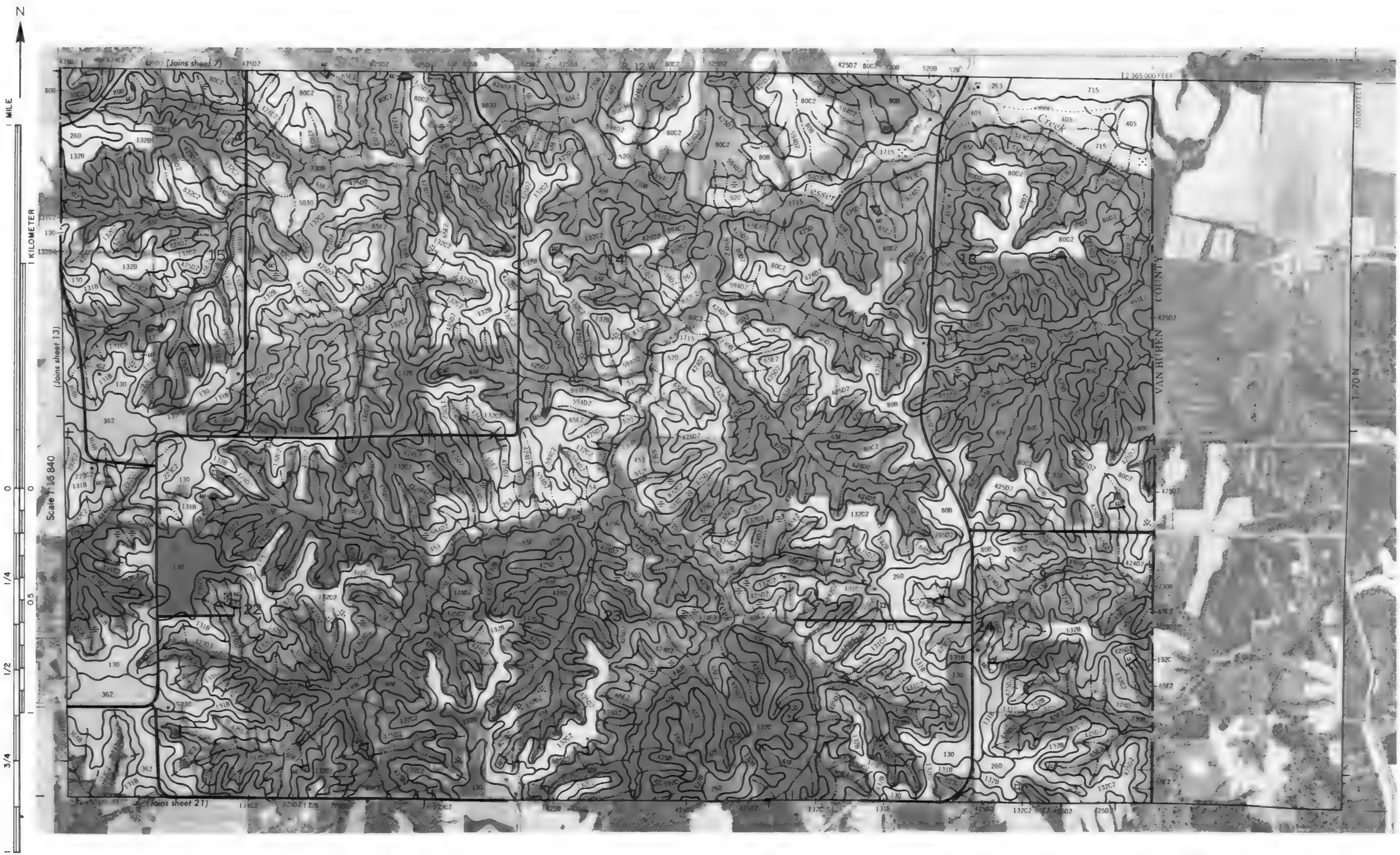
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

DAVIS COUNTY, IOWA NO. 12



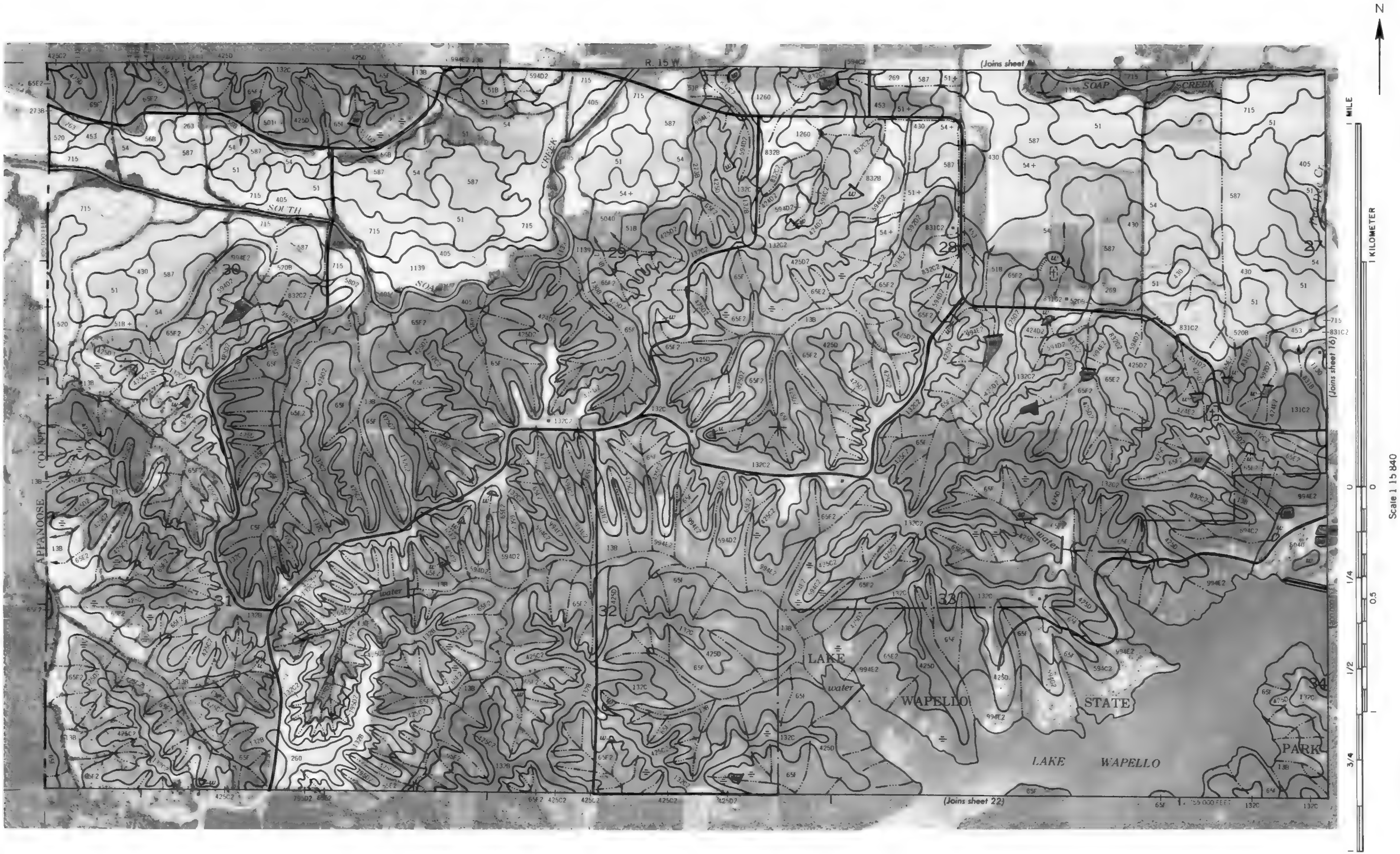
DAVIS COUNTY, IOWA NO. 13

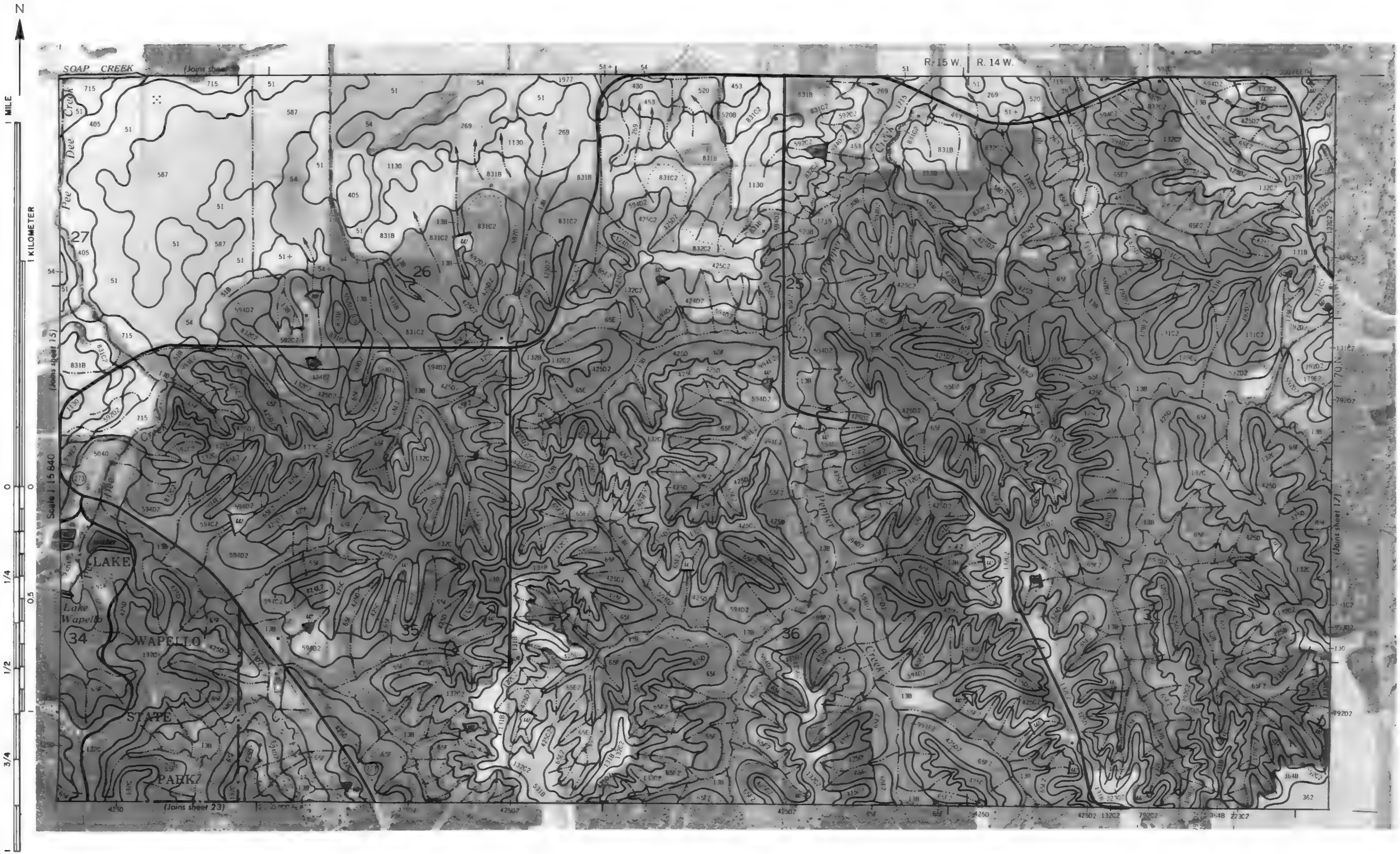
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


N
1 MILE
1 KILOMETER
Scale 1:15 840
(Joins sheet 7)
(Joins sheet 13)
(Joins sheet 21)
12 W.
2 365 000 FEET
320 000 FEET
VAN BUREN COUNTY
Creek
T. 70 N.
15
14
13
22
23
24

DAVIS COUNTY, IOWA NO. 15

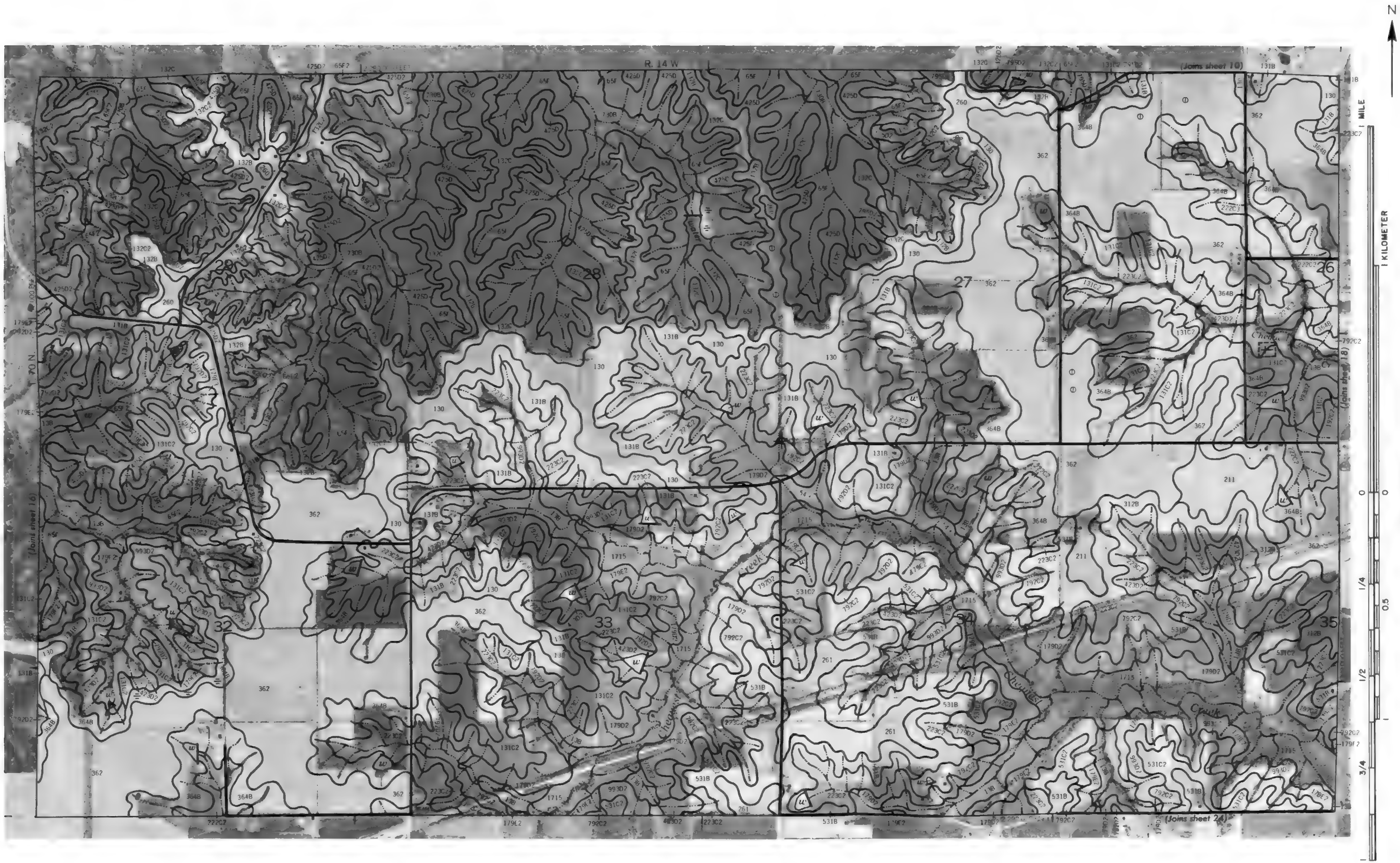
This soil survey map is compiled on 1978 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.





This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

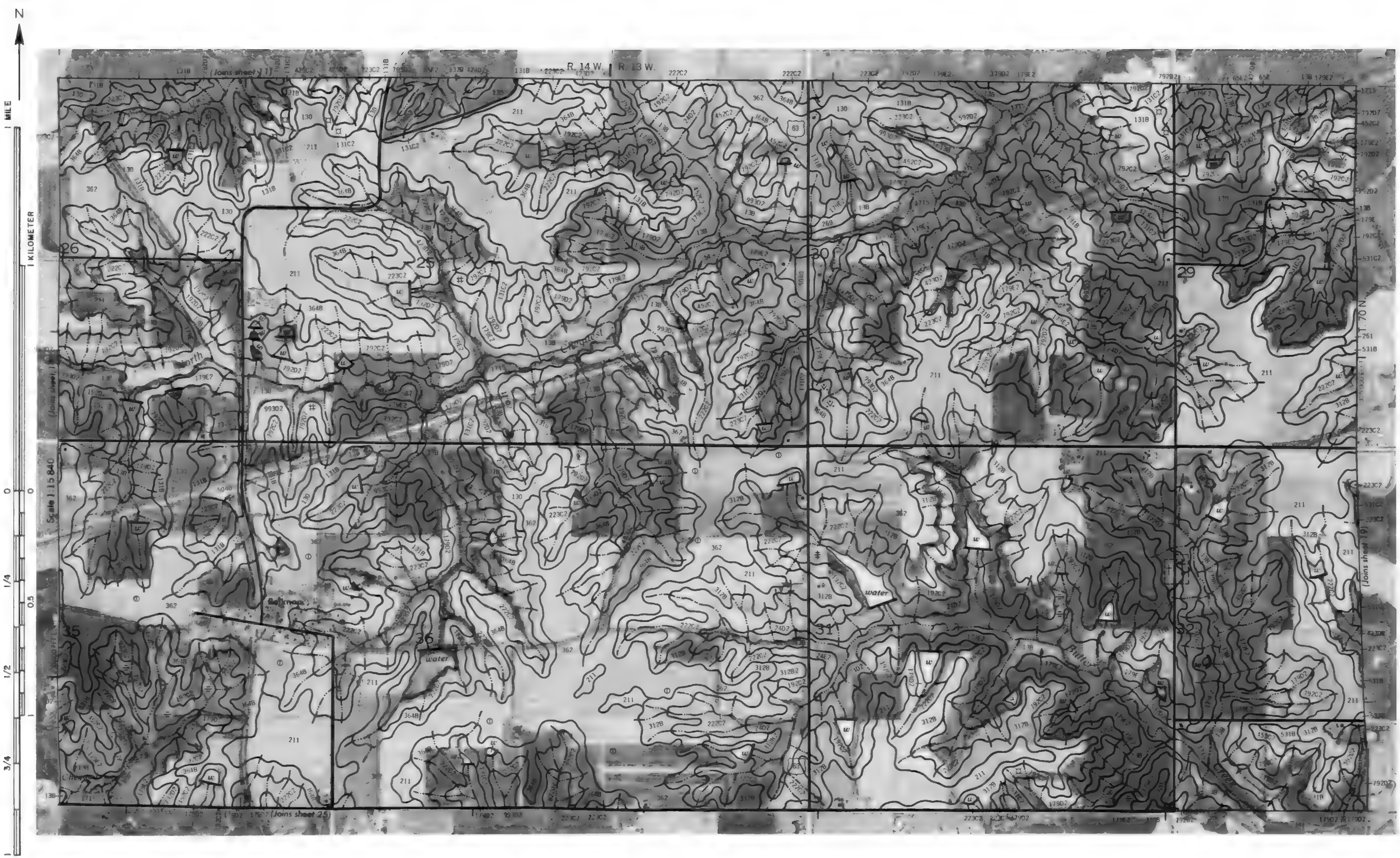
DAVIS COUNTY, IOWA NO. 16



DAVIS COUNTY, IOWA NO. 17

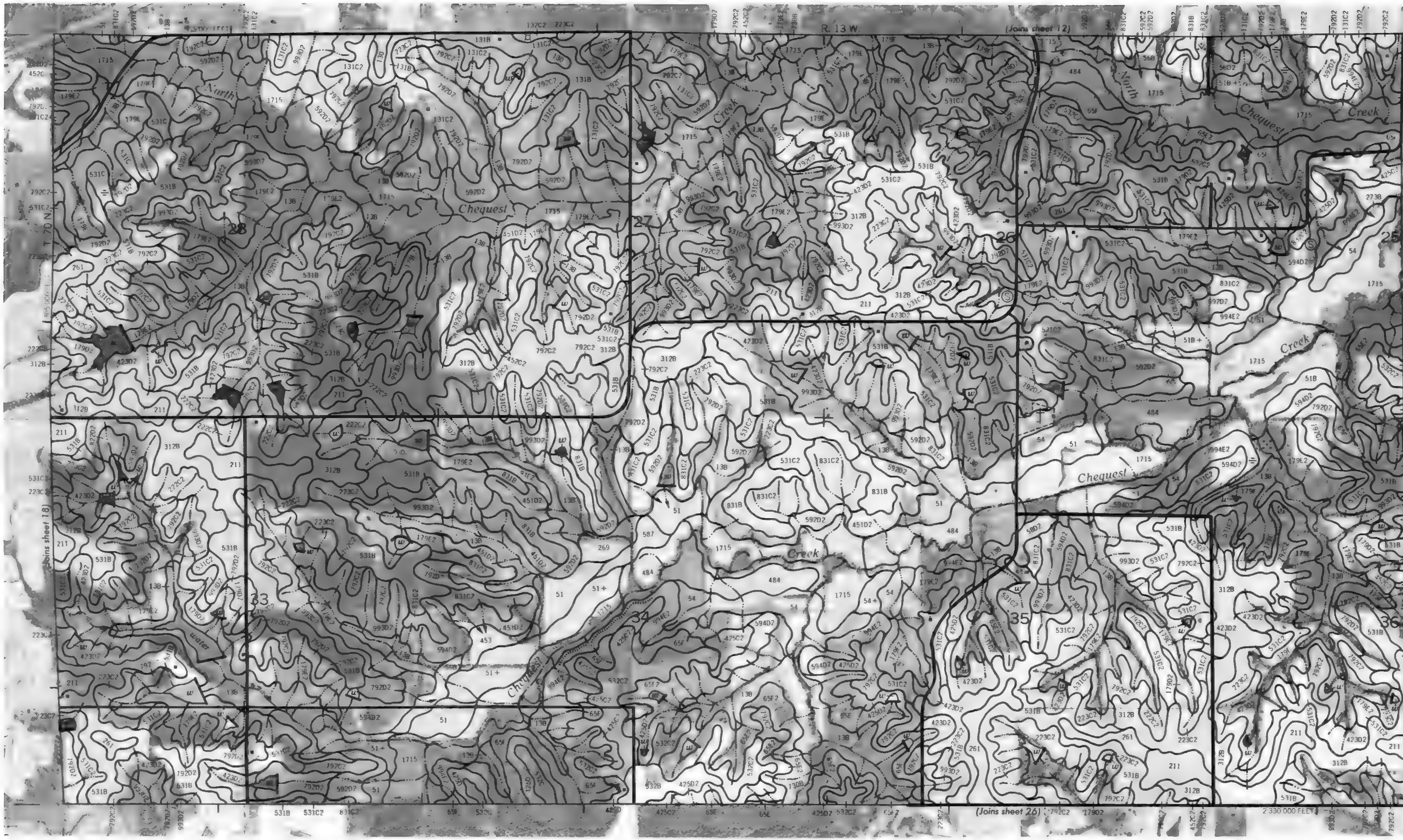
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 18



This soil survey map is compiled on 1979 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.

Coordinate grid ticks and land division corners, if shown, are approximately positioned.



N

MILE

KILOMETER

Scale 1:15 840

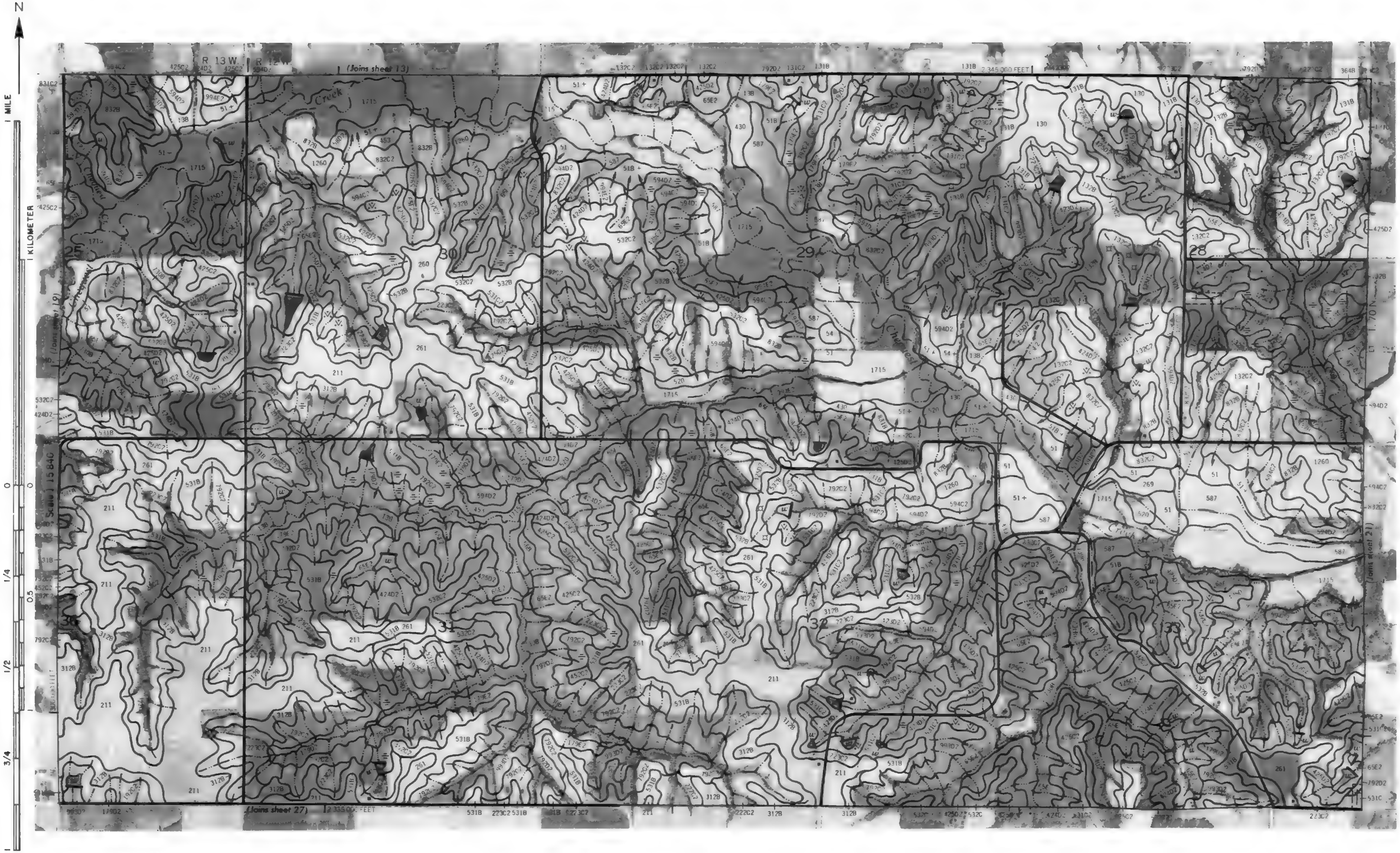
0 1/4 1/2 3/4 1

0 0.5 1

DAVIS COUNTY, IOWA NO. 19

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

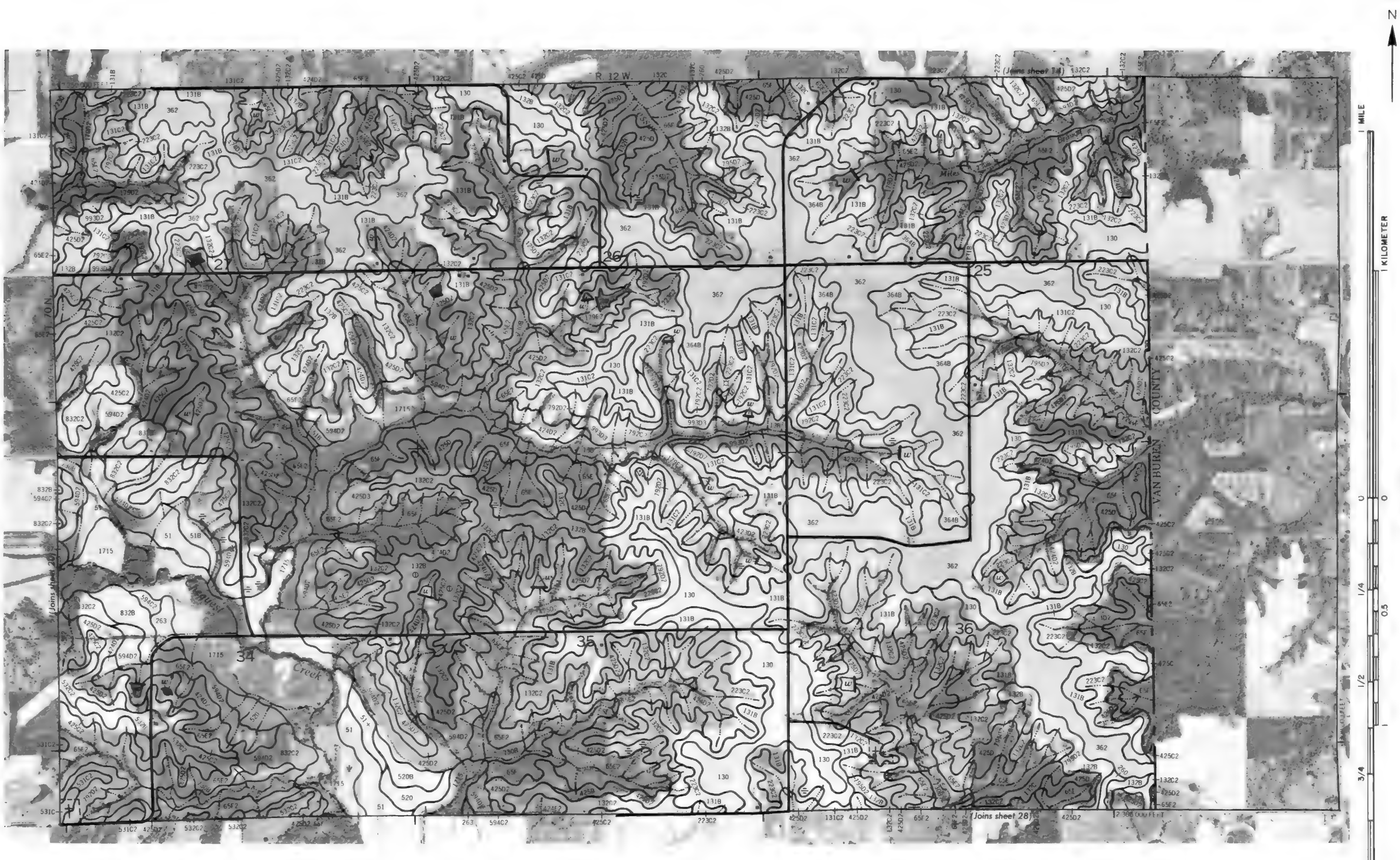
SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 20



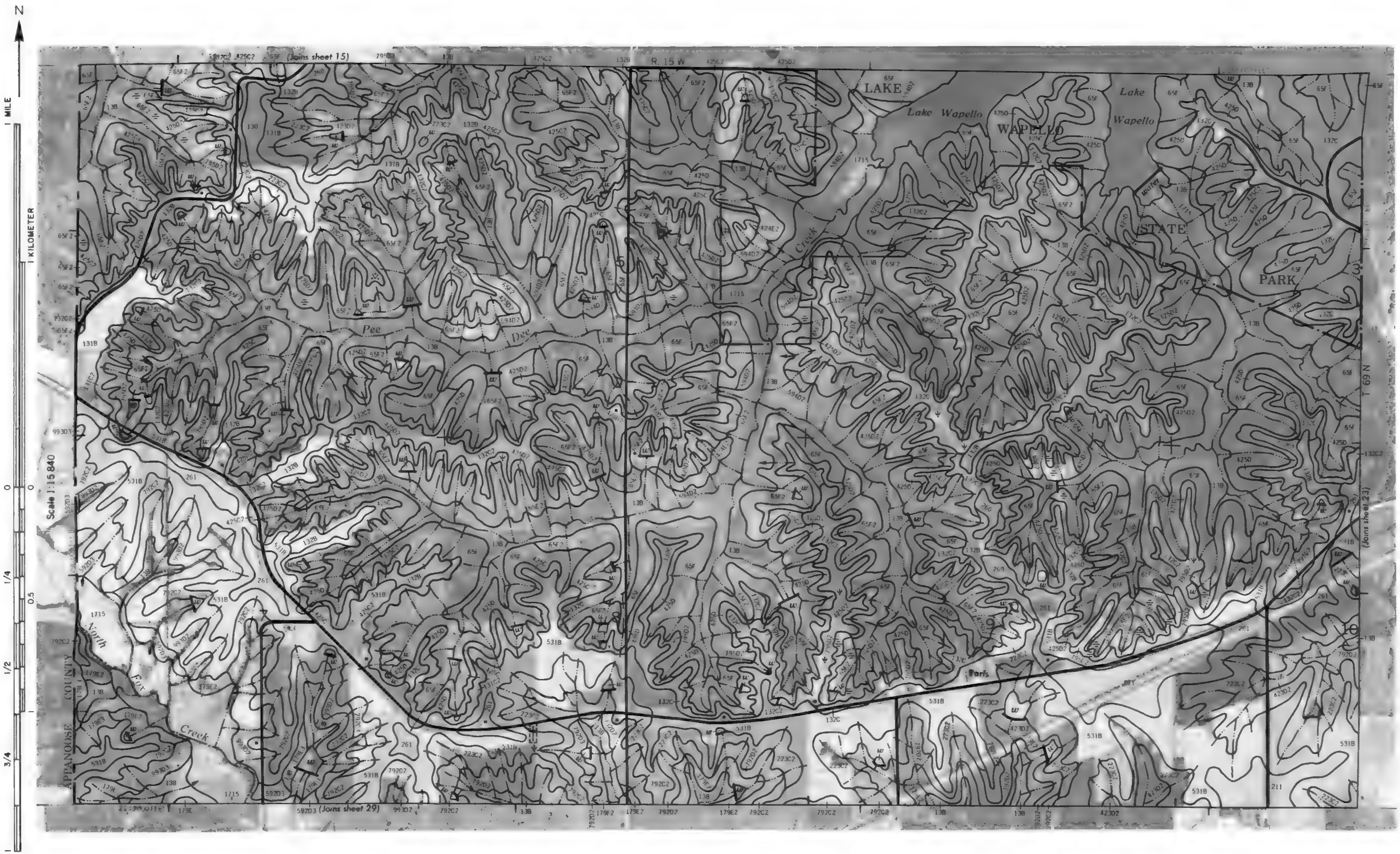
DAVIS COUNTY, IOWA NO. 20

DAVIS COUNTY, IOWA NO. 21

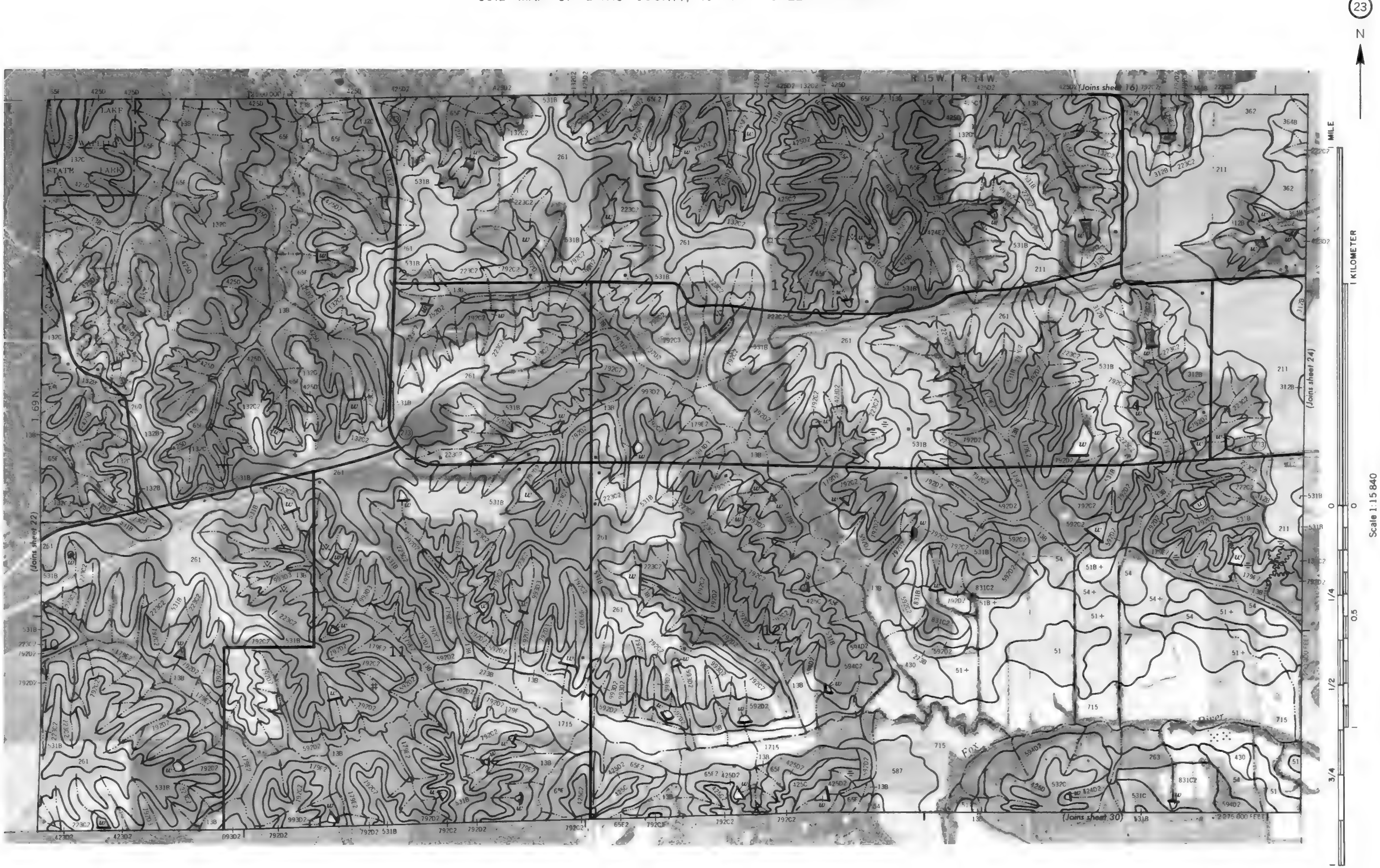
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

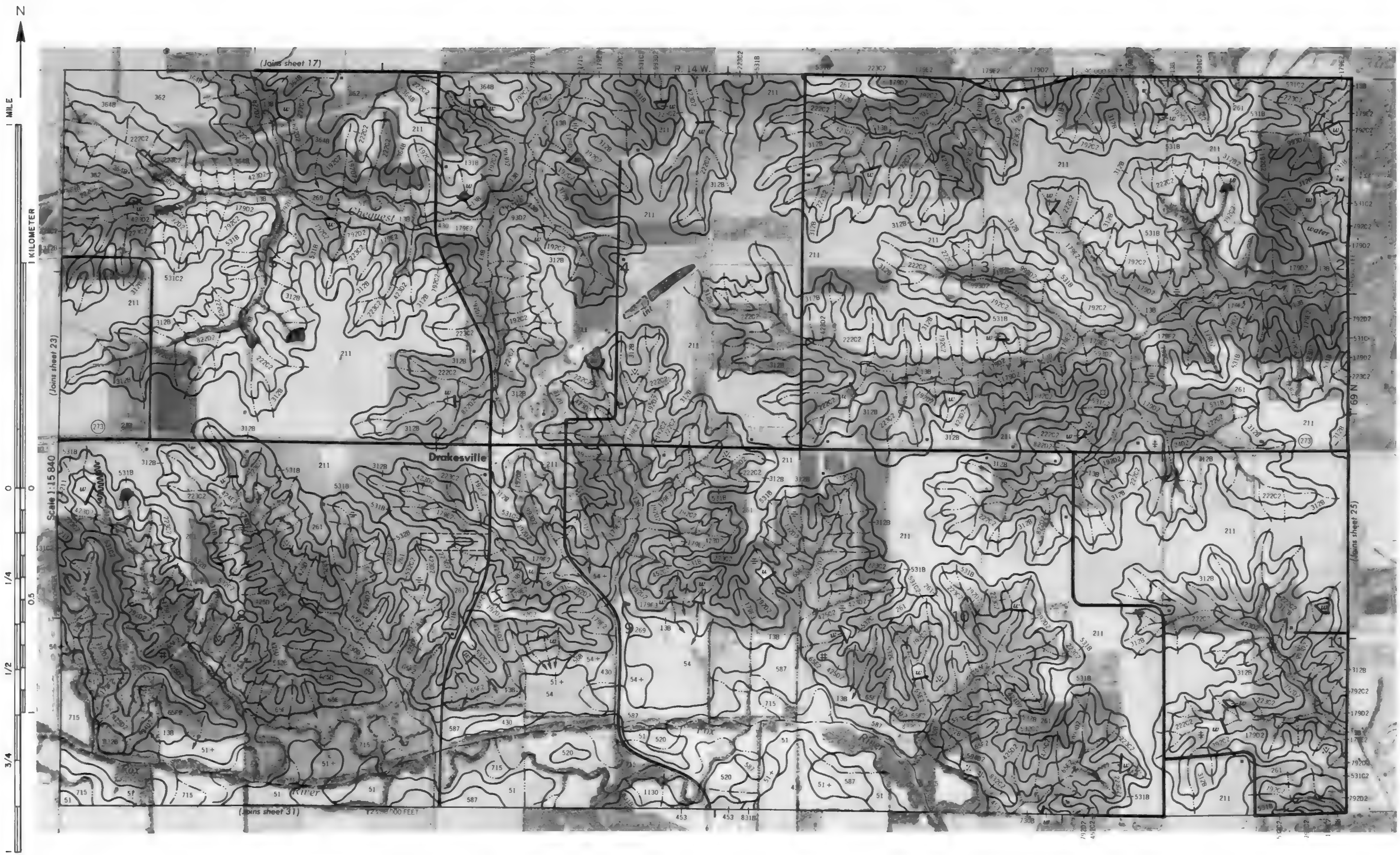


SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 22

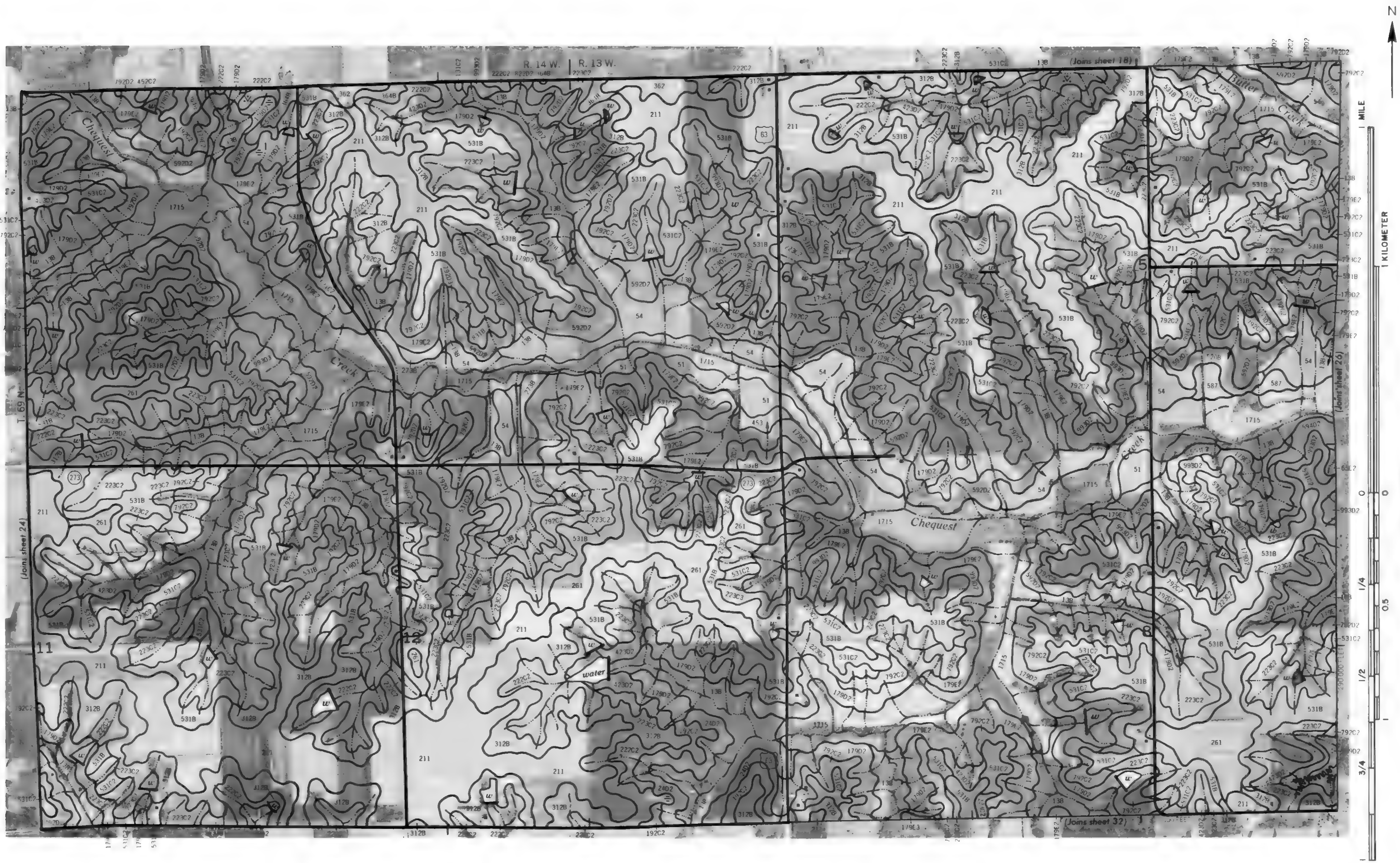


DAVIS COUNTY, IOWA NO. 22


23
N
R. 15 W.
R. 14 W.
(Joins sheet 16)
(Joins sheet 24)
(Joins sheet 30)
(Joins sheet 22)
T. 69 N.
LAKE
WAPELLO
STATE
LAKE
Fox
River
MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5

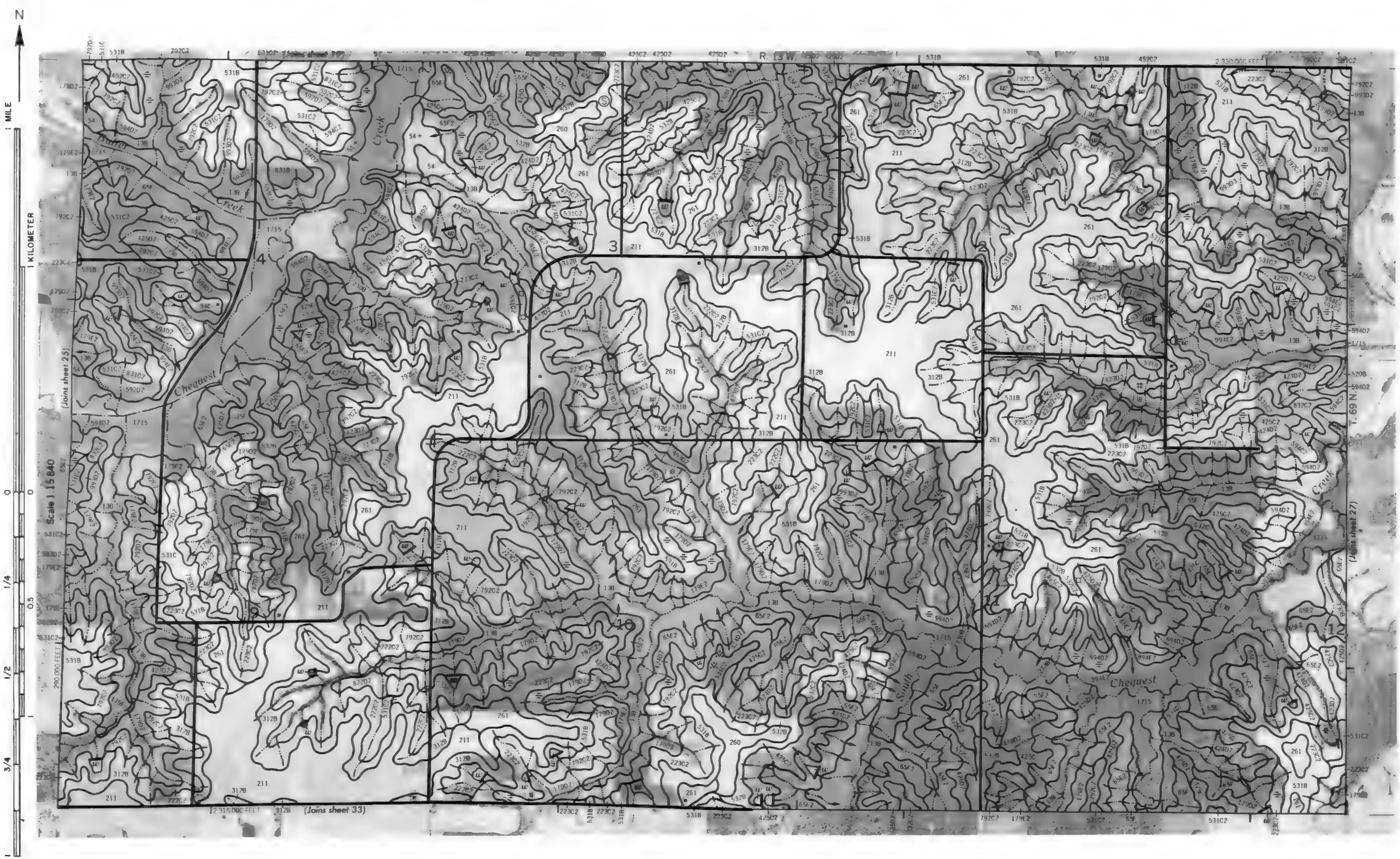

N
MILE
KILOMETER
Scale 1:15 840
(Joins sheet 17)
R. 14 W.
(Joins sheet 23)
(Joins sheet 25)
(Joins sheet 31)
Drakesville
T 69 N
Chequest
Creek
Fox
River

(25)



DAVIS COUNTY, IOWA NO. 25

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

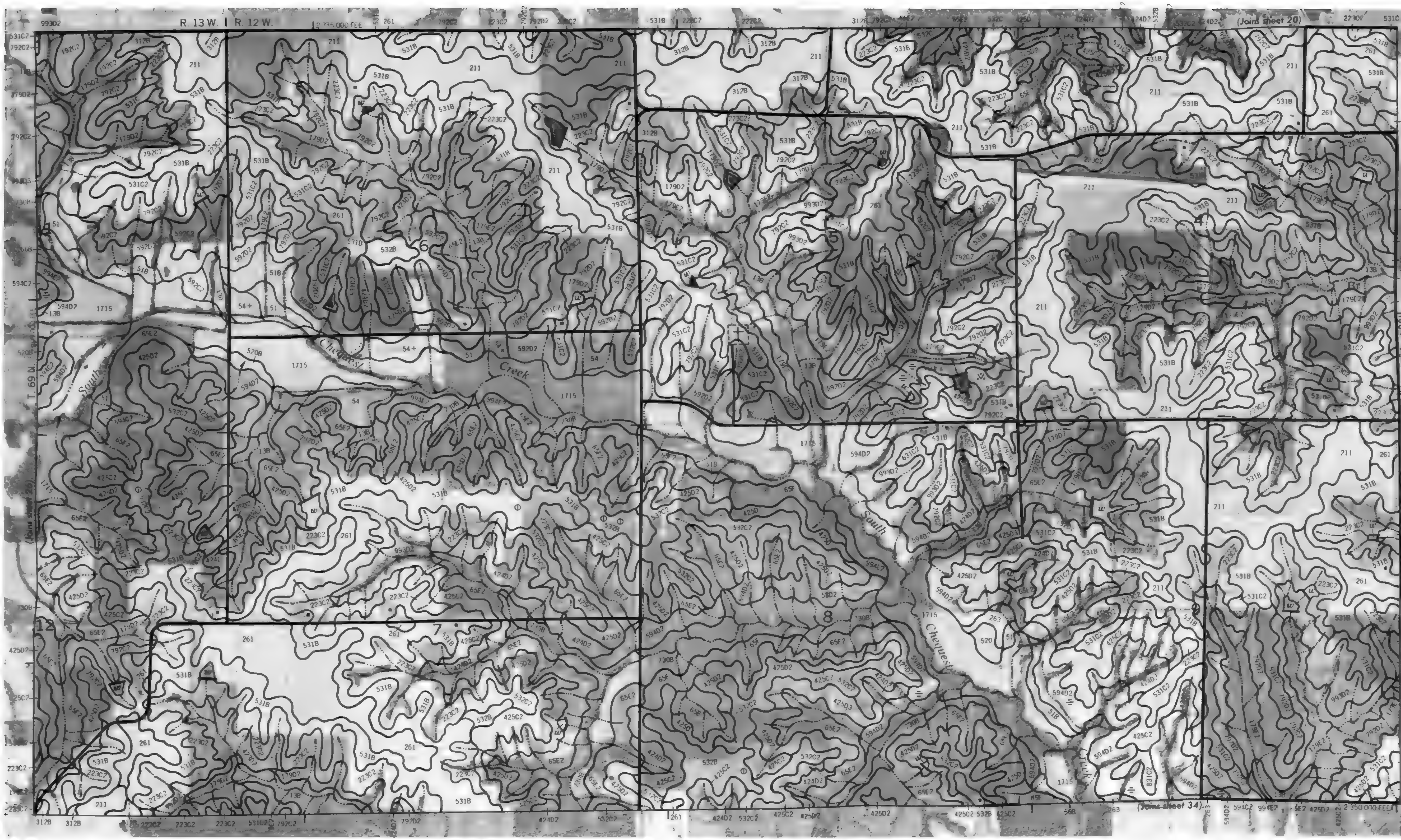


This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

DAVIS COUNTY, IOWA NO. 26

(27)

N

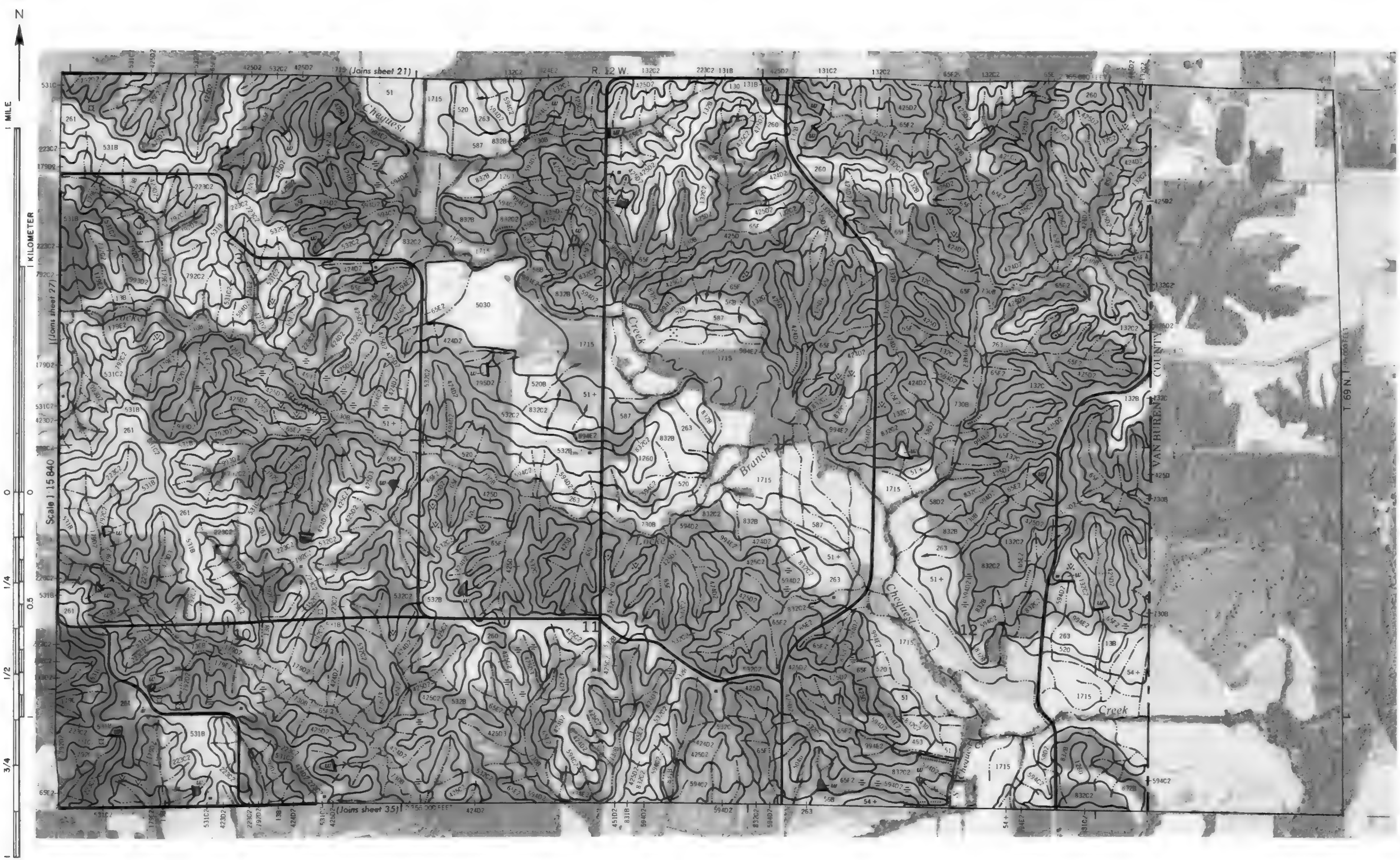


MILE
KILOMETER
0
1/4
0.5
1/2
3/4
1
Scale 1:15 840

DAVIS COUNTY, IOWA NO. 27

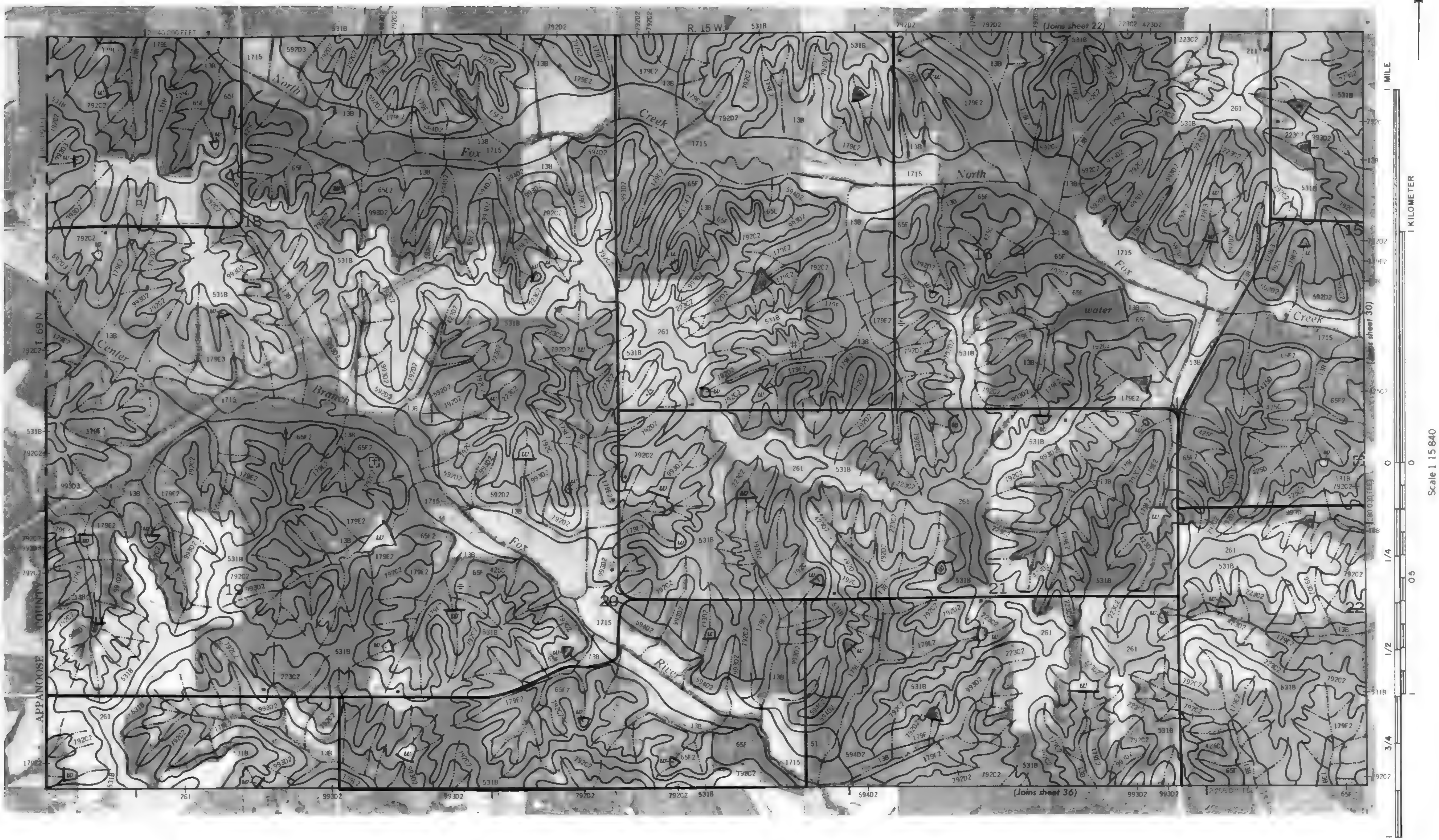
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 28



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and division corners, if shown, are approximately positioned.

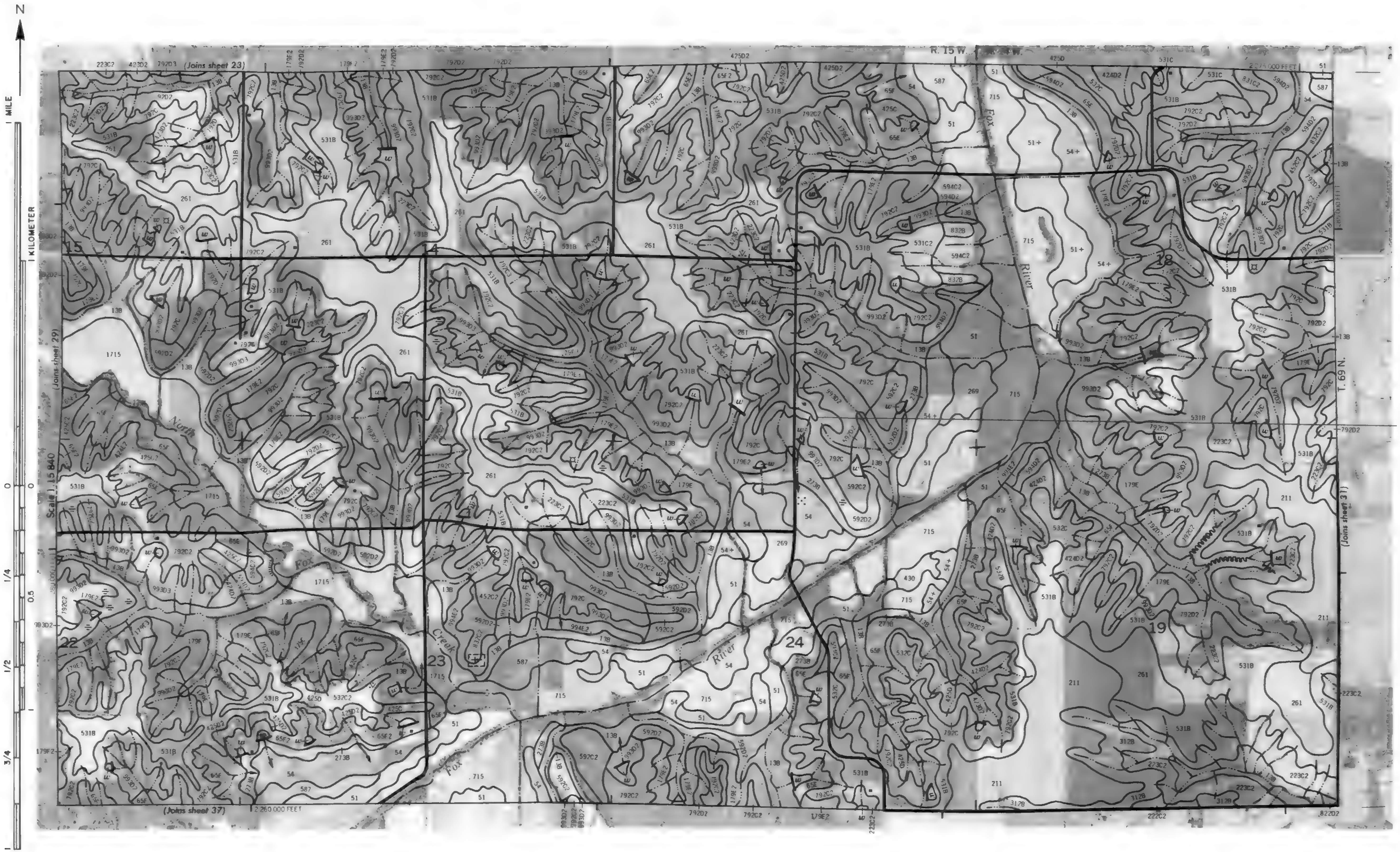
DAVIS COUNTY, IOWA NO. 28



DAVIS COUNTY, IOWA NO. 29

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Land division corners, if shown, are approximately positioned.

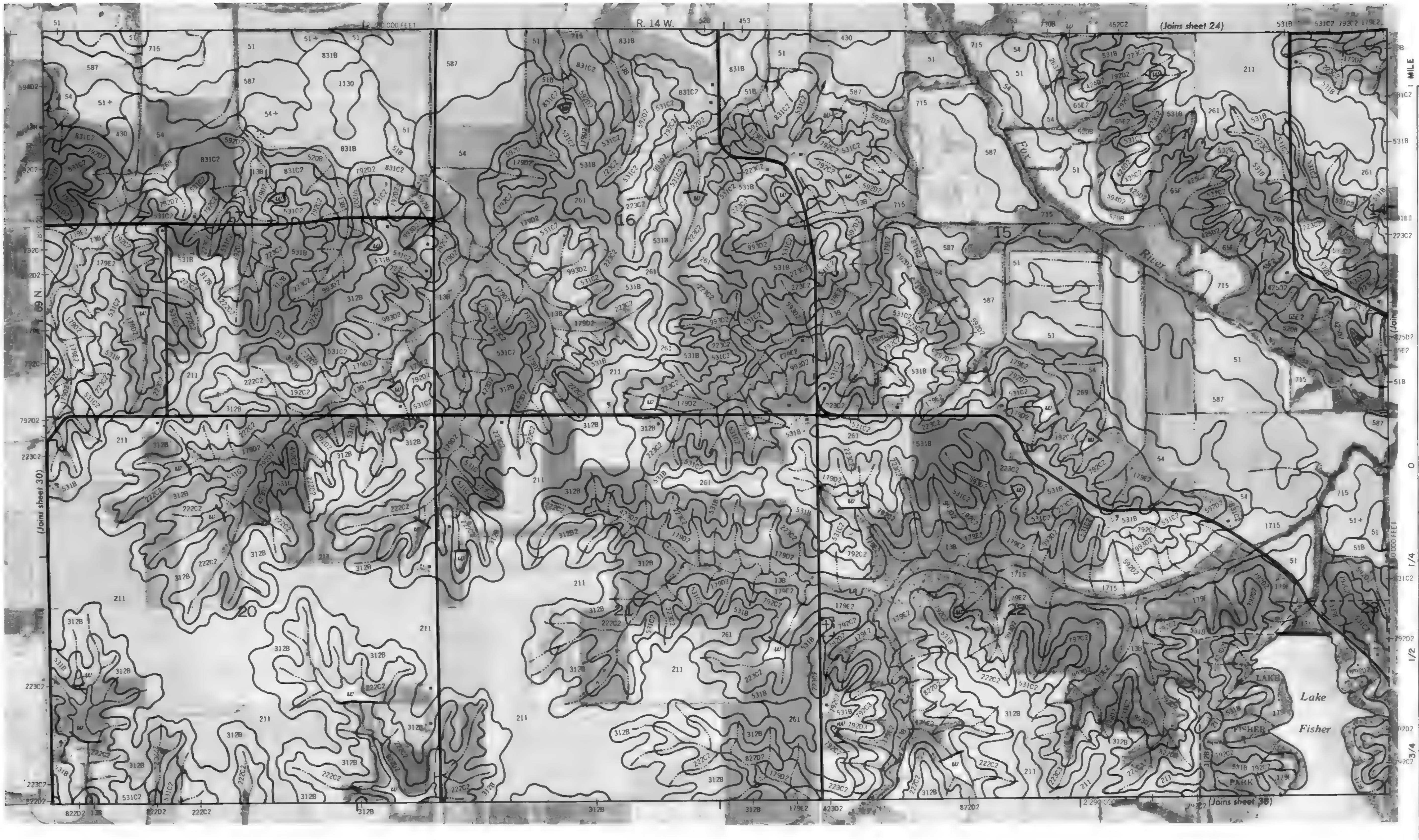
SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 30



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners if shown are approximately positioned

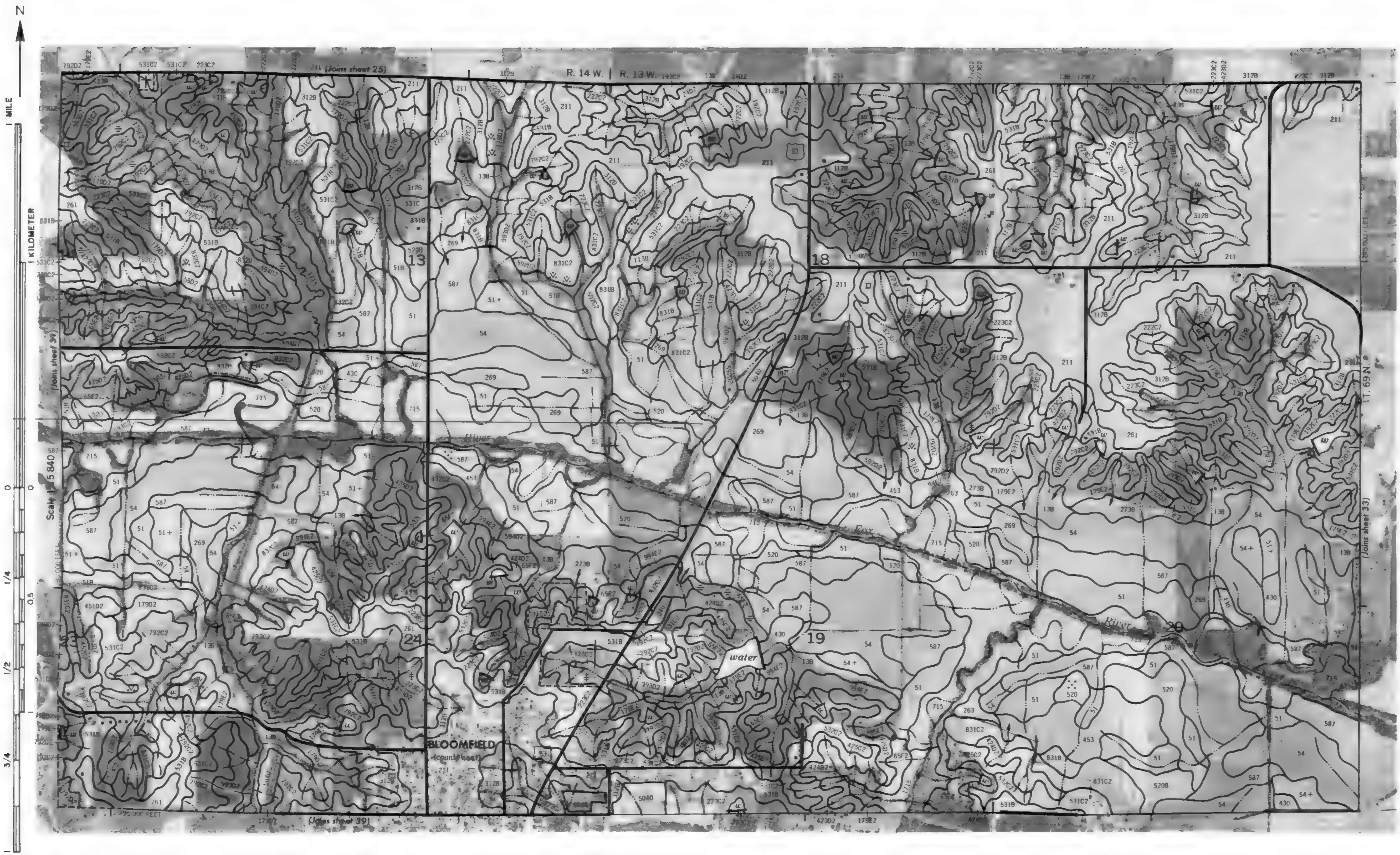
31

N



DAVIS COUNTY, IOWA NO. 31

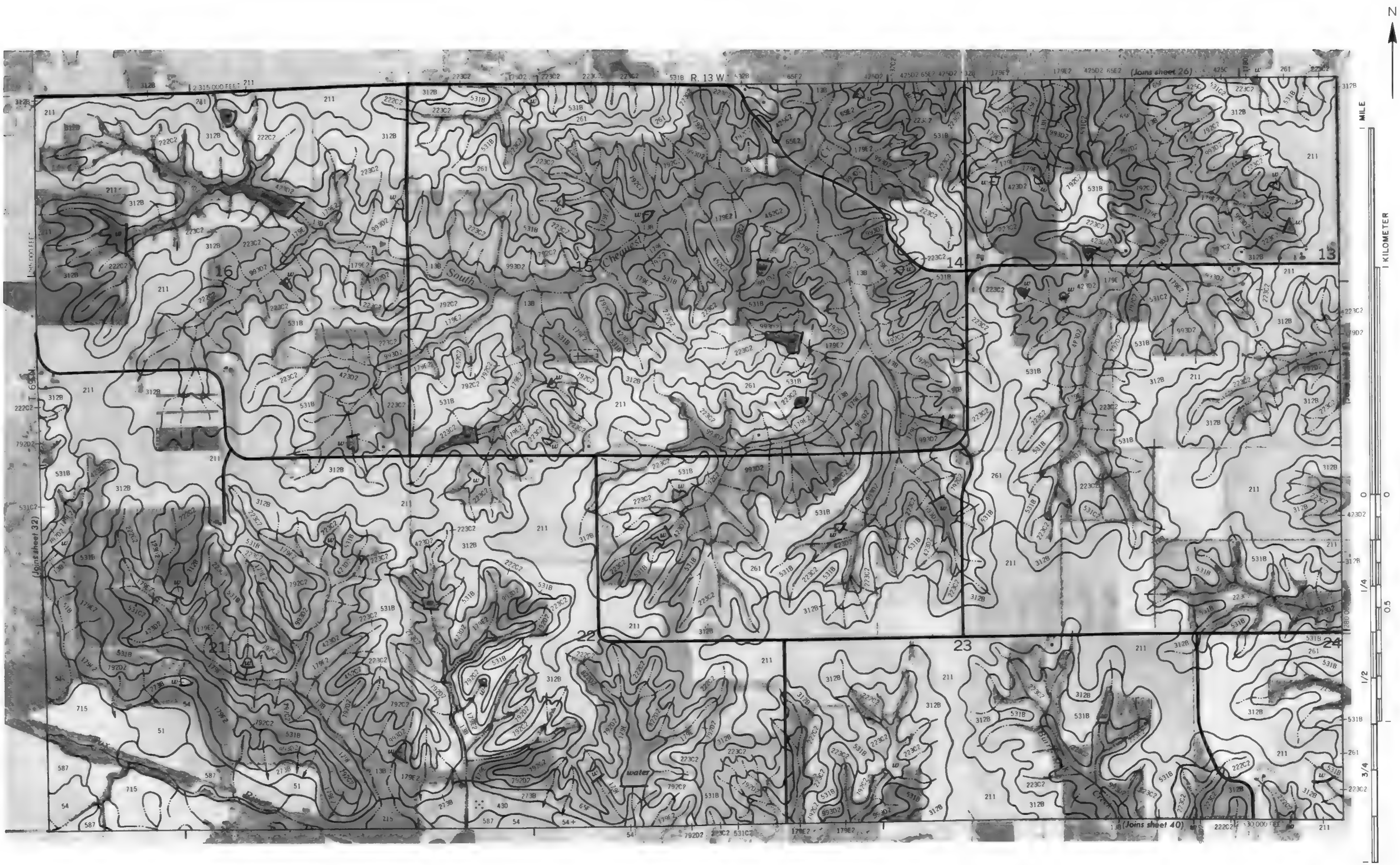
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



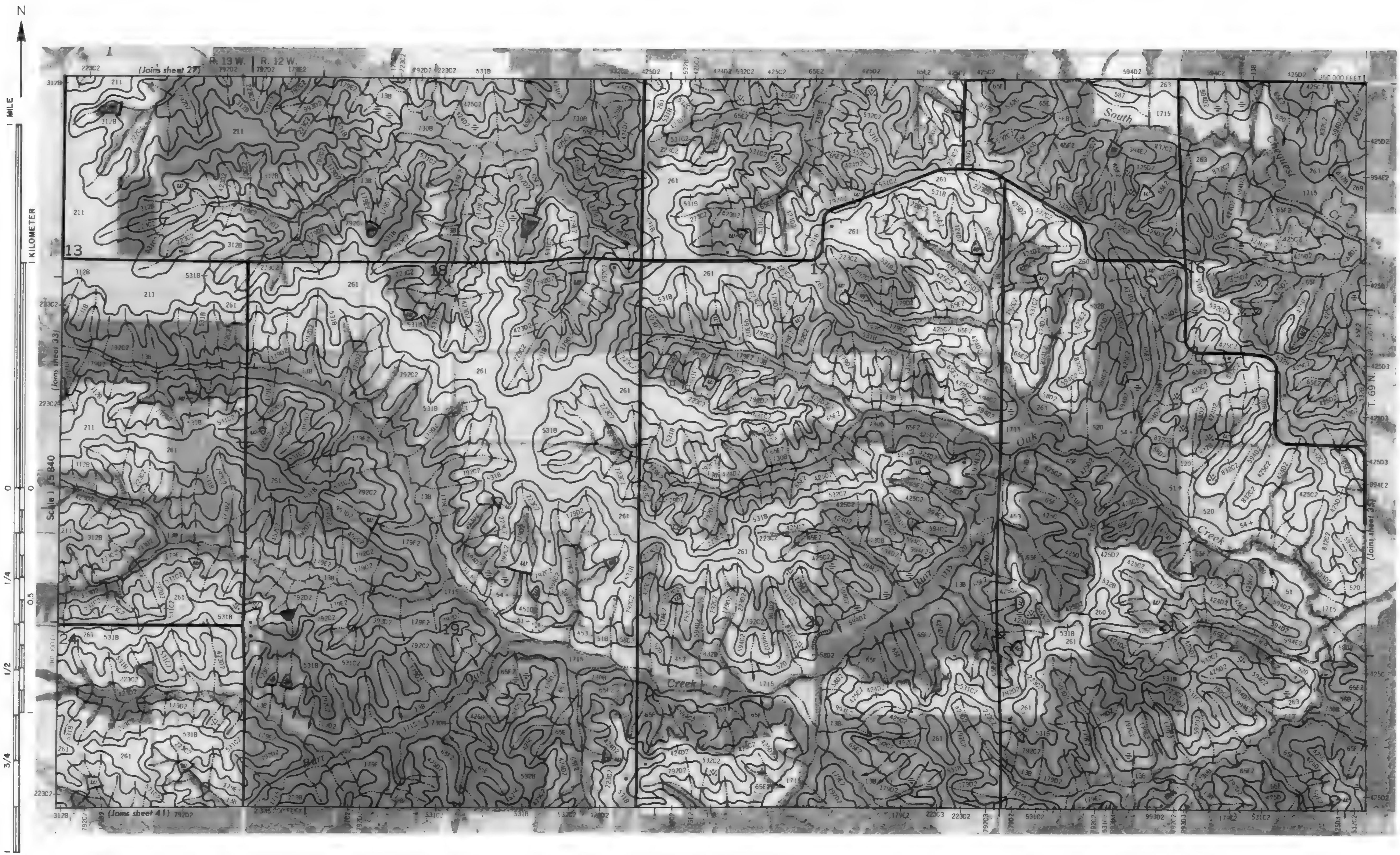
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

DAVIS COUNTY, IOWA NO. 32

This soil survey map is compiled on 1979 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 34

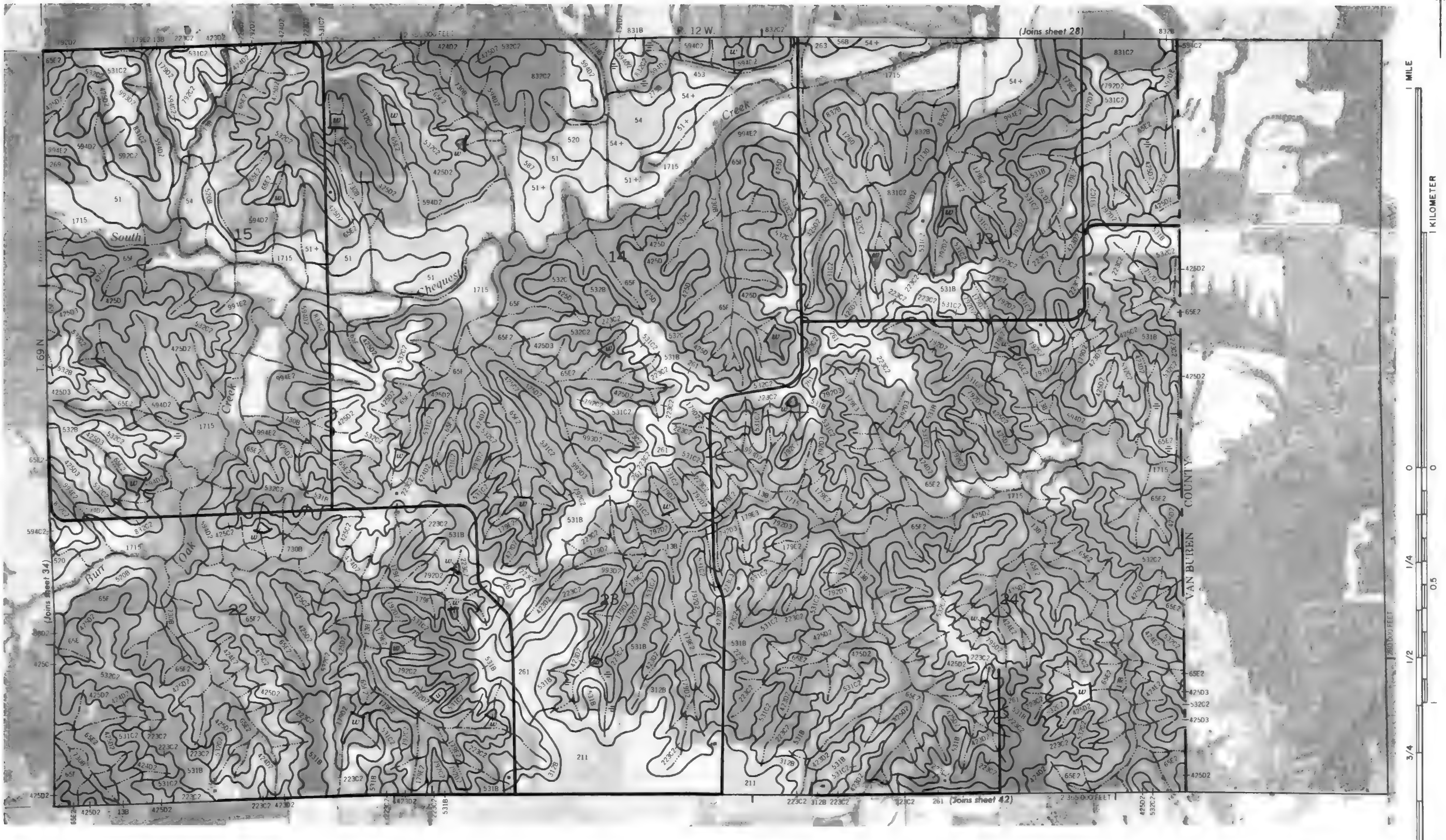


This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

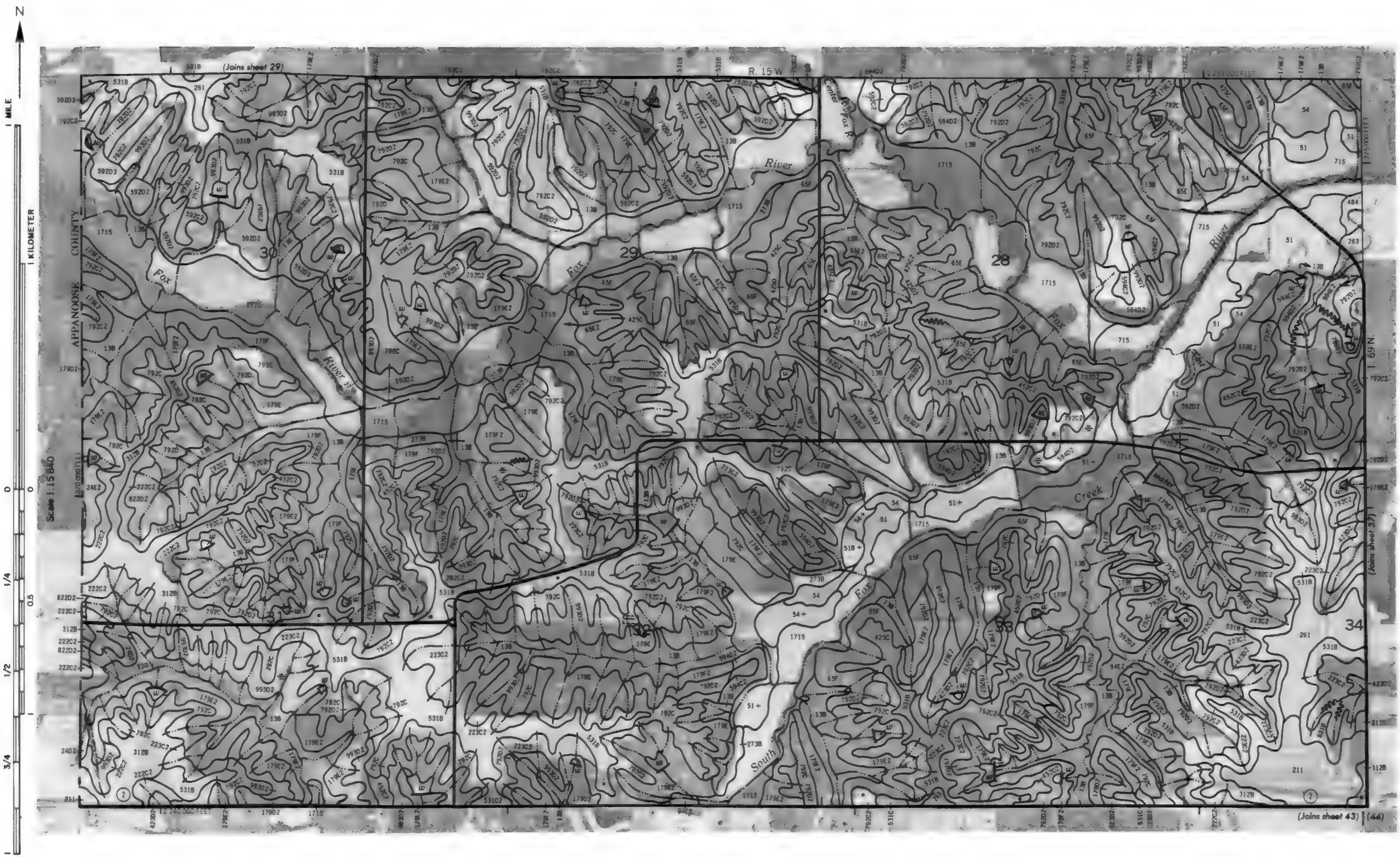
DAVIS COUNTY, IOWA NO. 34

DAVIS COUNTY, IOWA NO. 35

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 36

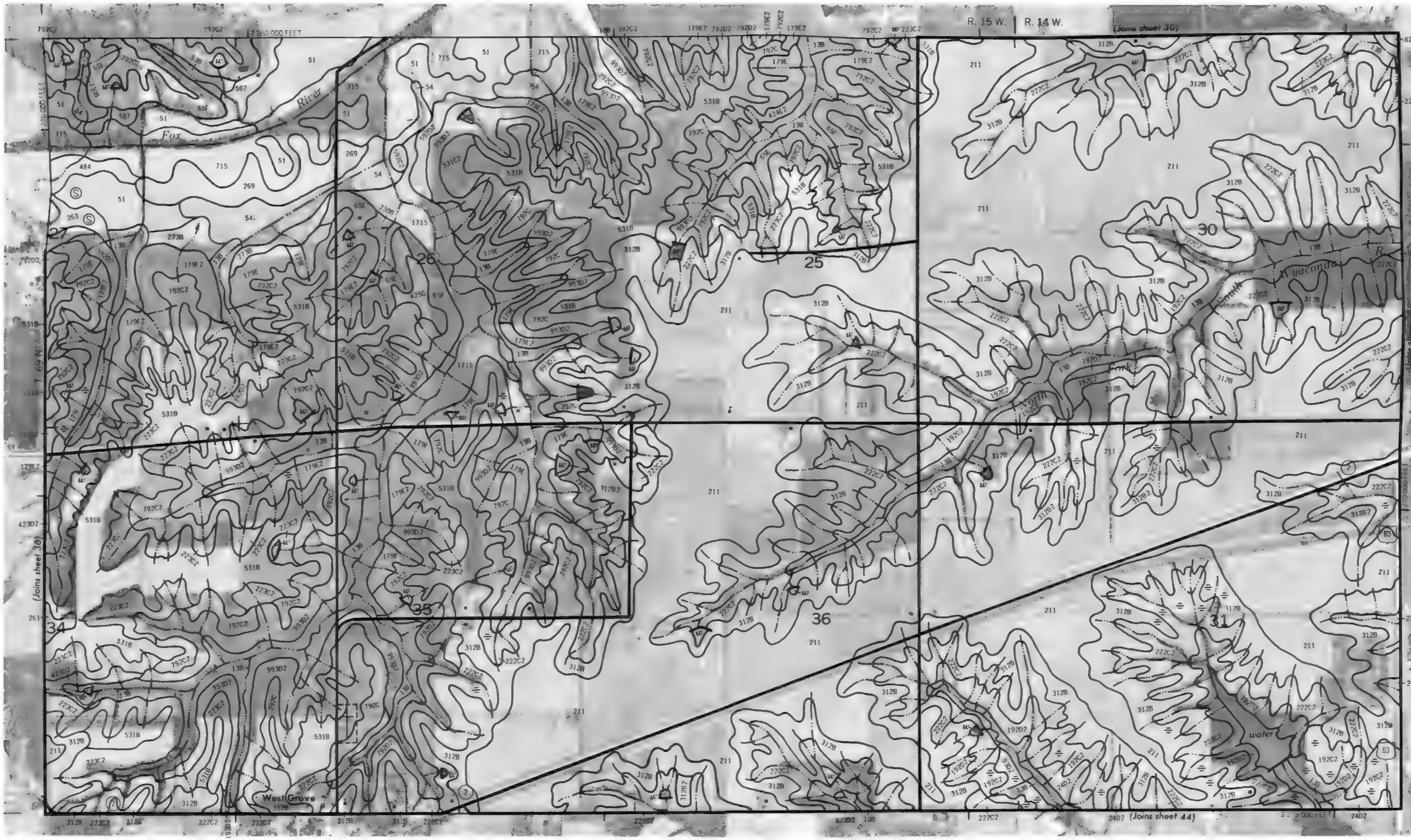


This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

37

DAVIS COUNTY, IOWA NO. 37

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned



N

1 MILE

1 KILOMETER

Scale 1:15 840

N

1 MILE

1 KILOMETER

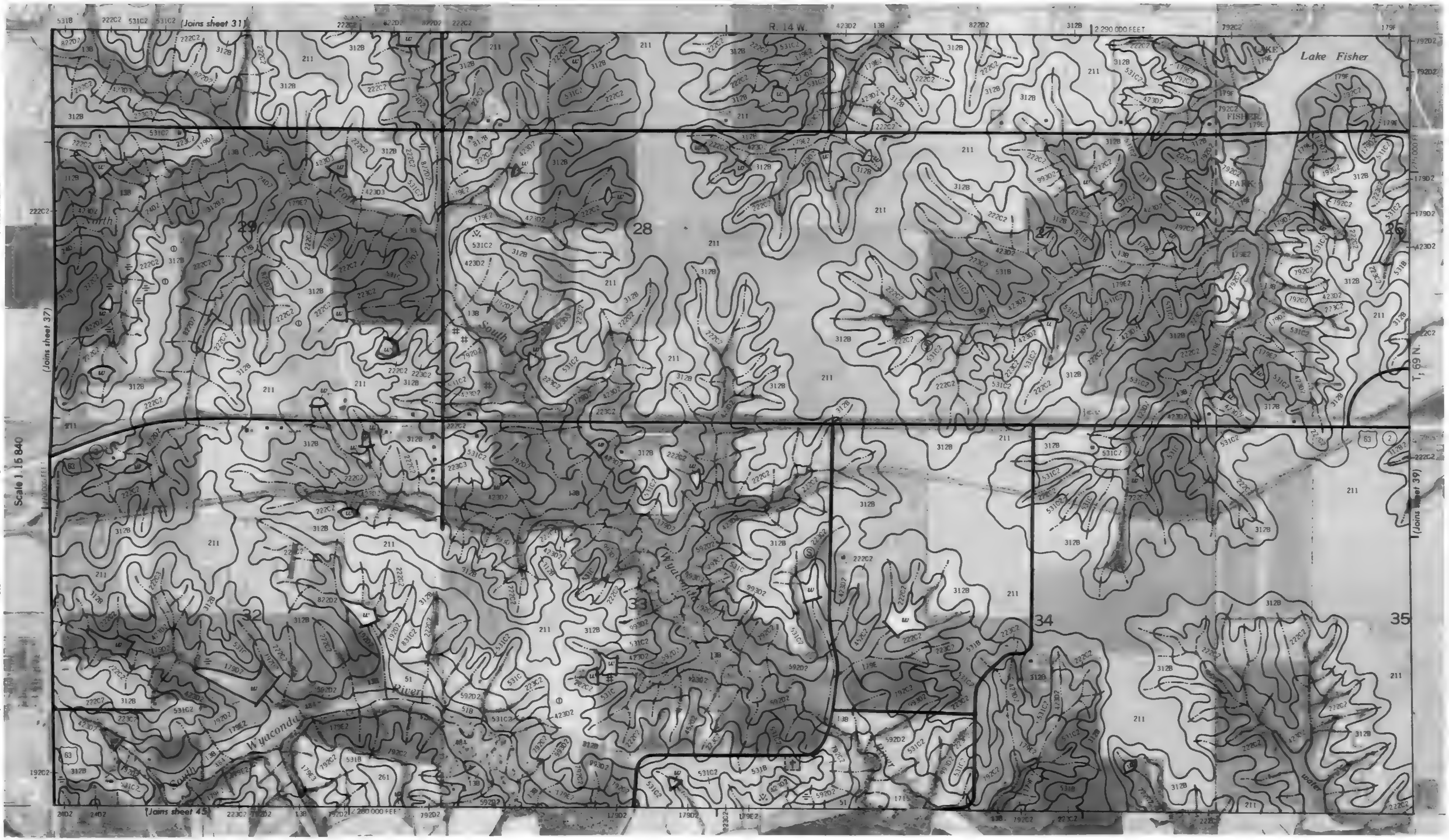
0 0

1/4

0.5

1/2

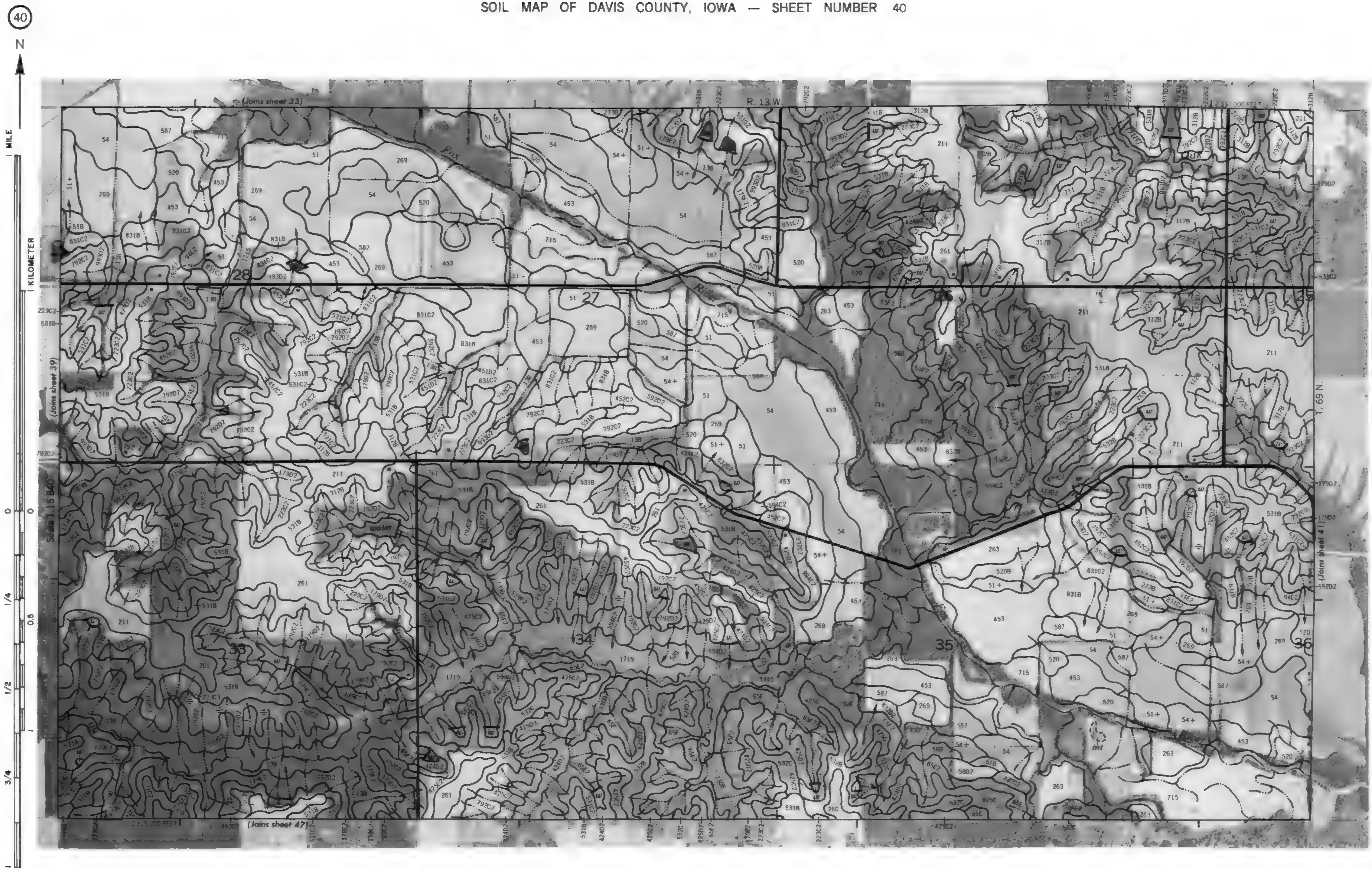
3/4



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

DAVIS COUNTY, IOWA NO. 38

DAVIS COUNTY, IOWA NO. 39

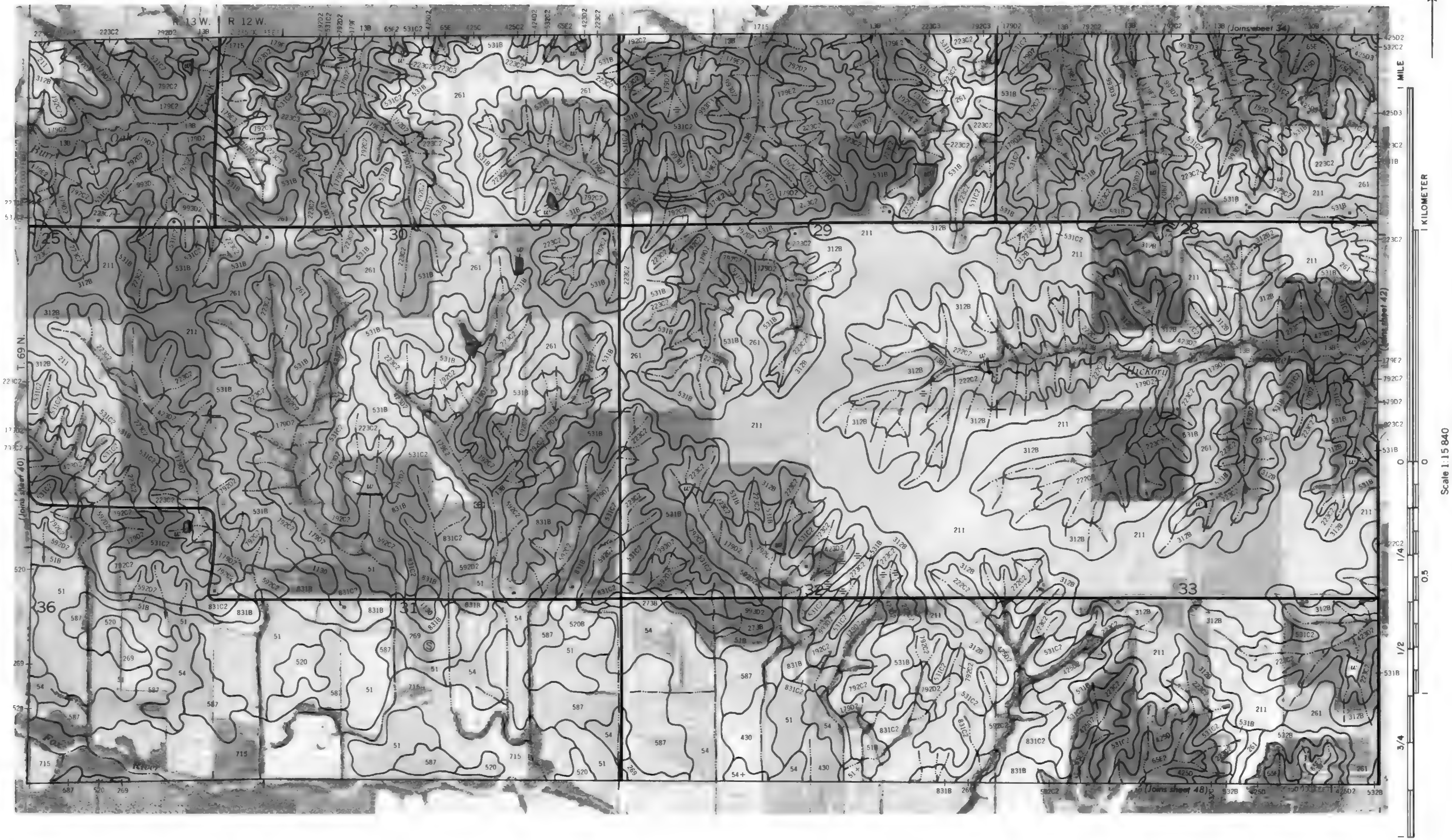


This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

DAVIS COUNTY, IOWA NO. 40

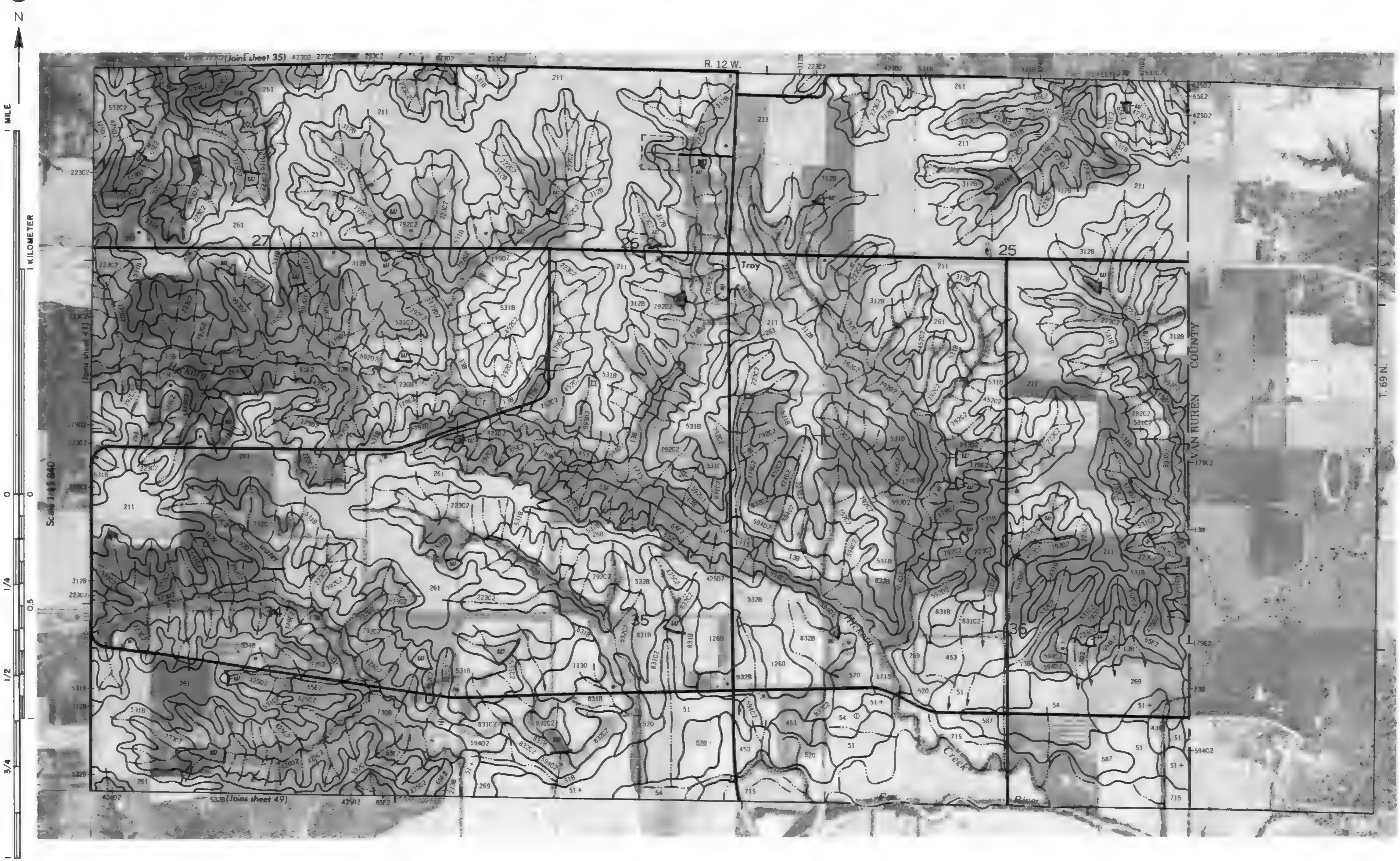
41

N



DAVIS COUNTY, IOWA NO. 41

SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 42

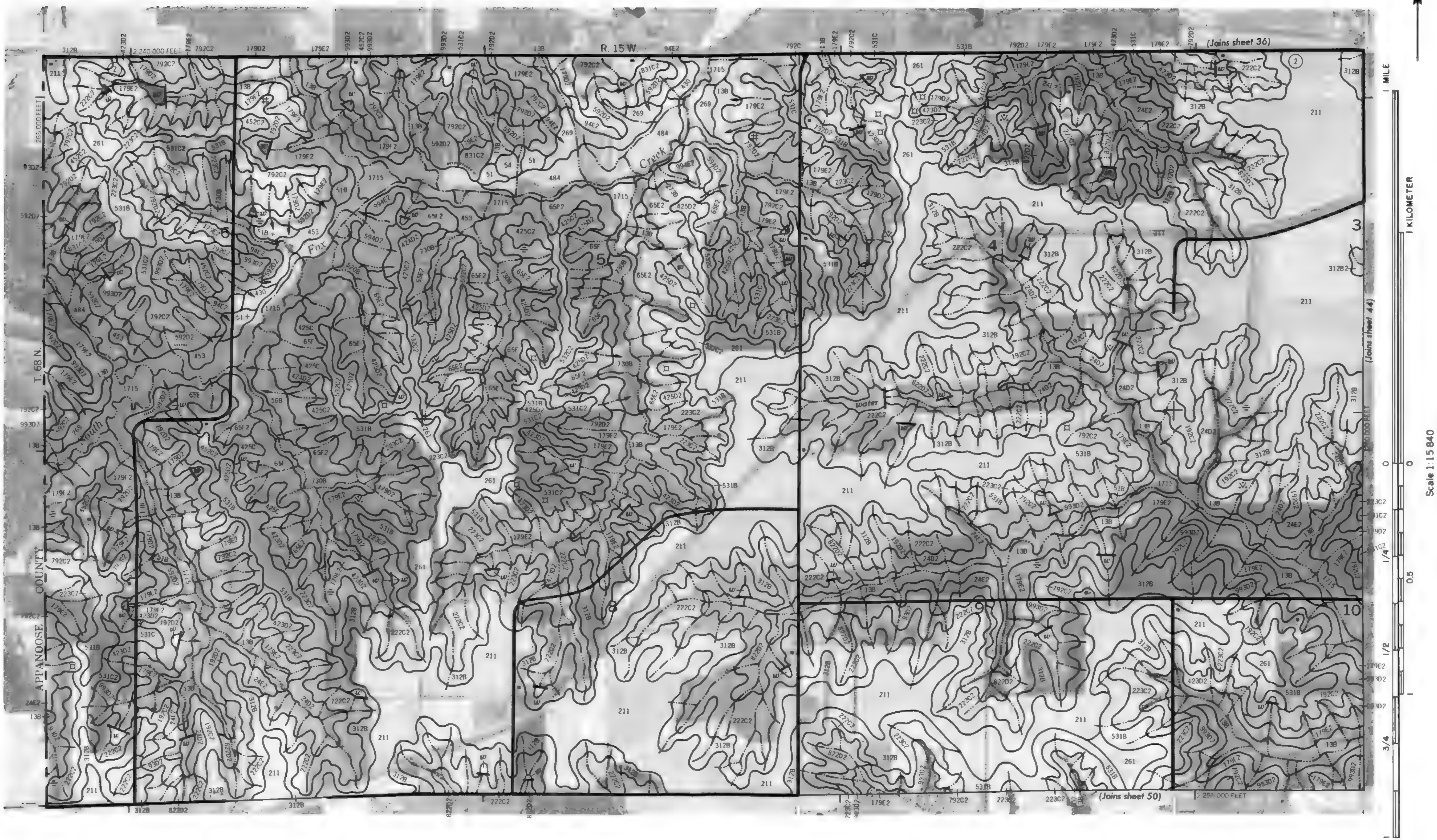


This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

DAVIS COUNTY, IOWA NO. 42

43

N



DAVIS COUNTY, IOWA NO. 43

SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 44

N

1 MILE

1 KILOMETER

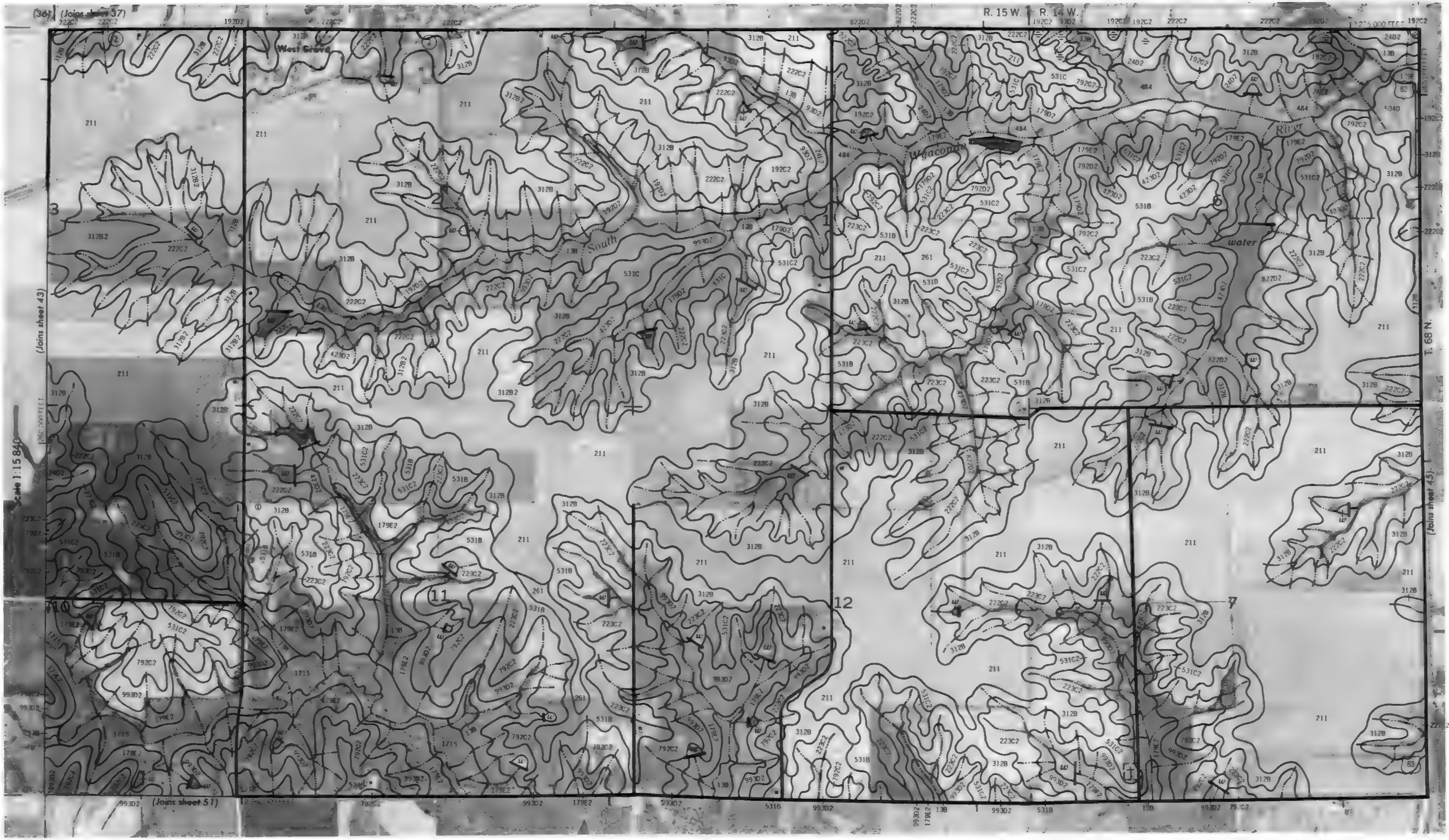
0

1/4

0.5

1/2

3/4



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 45

45

N

DAVIS COUNTY, IOWA NO. 45

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 MILE

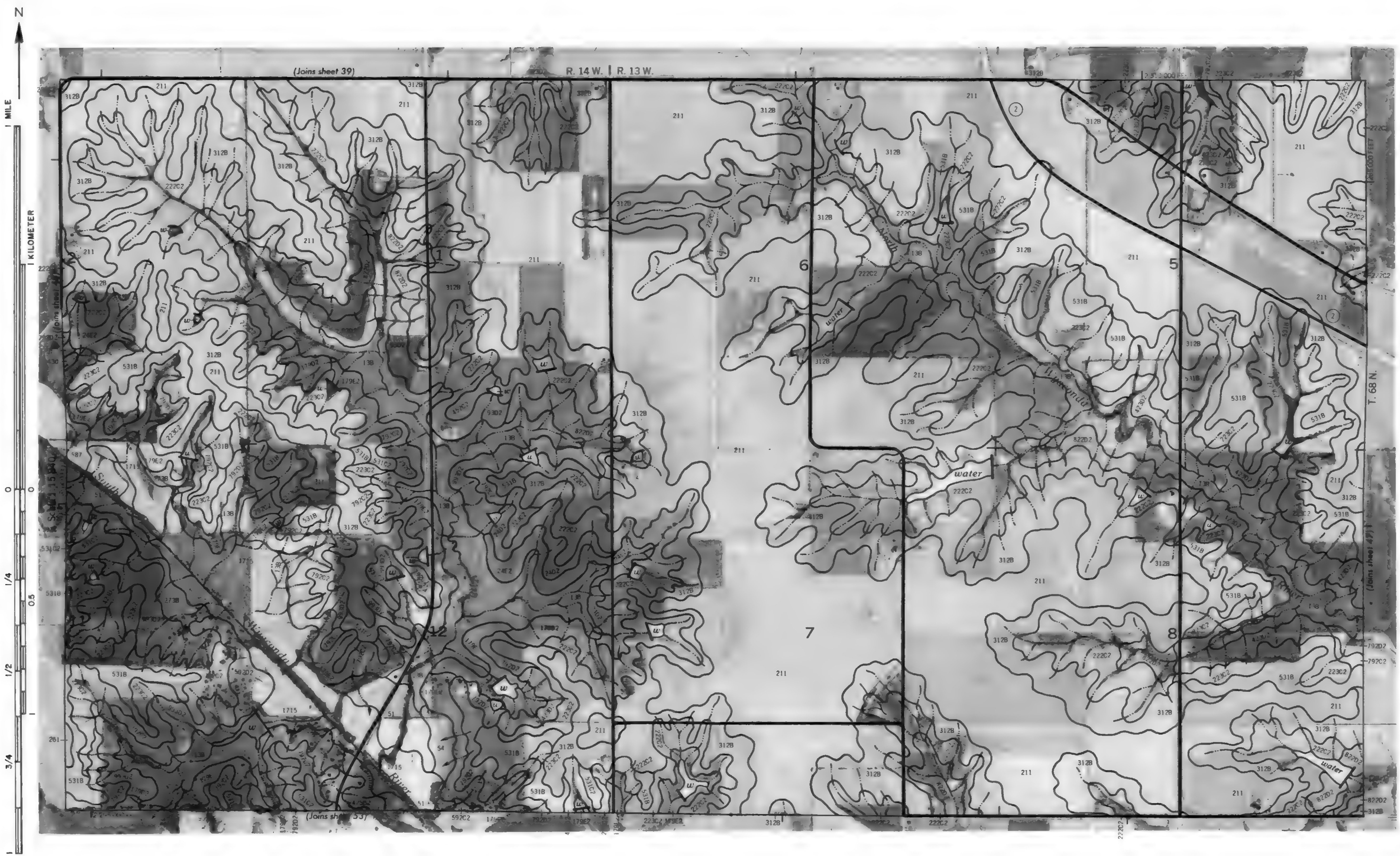
1 KILOMETER

0 1/4 1/2 3/4

0 0.5 1

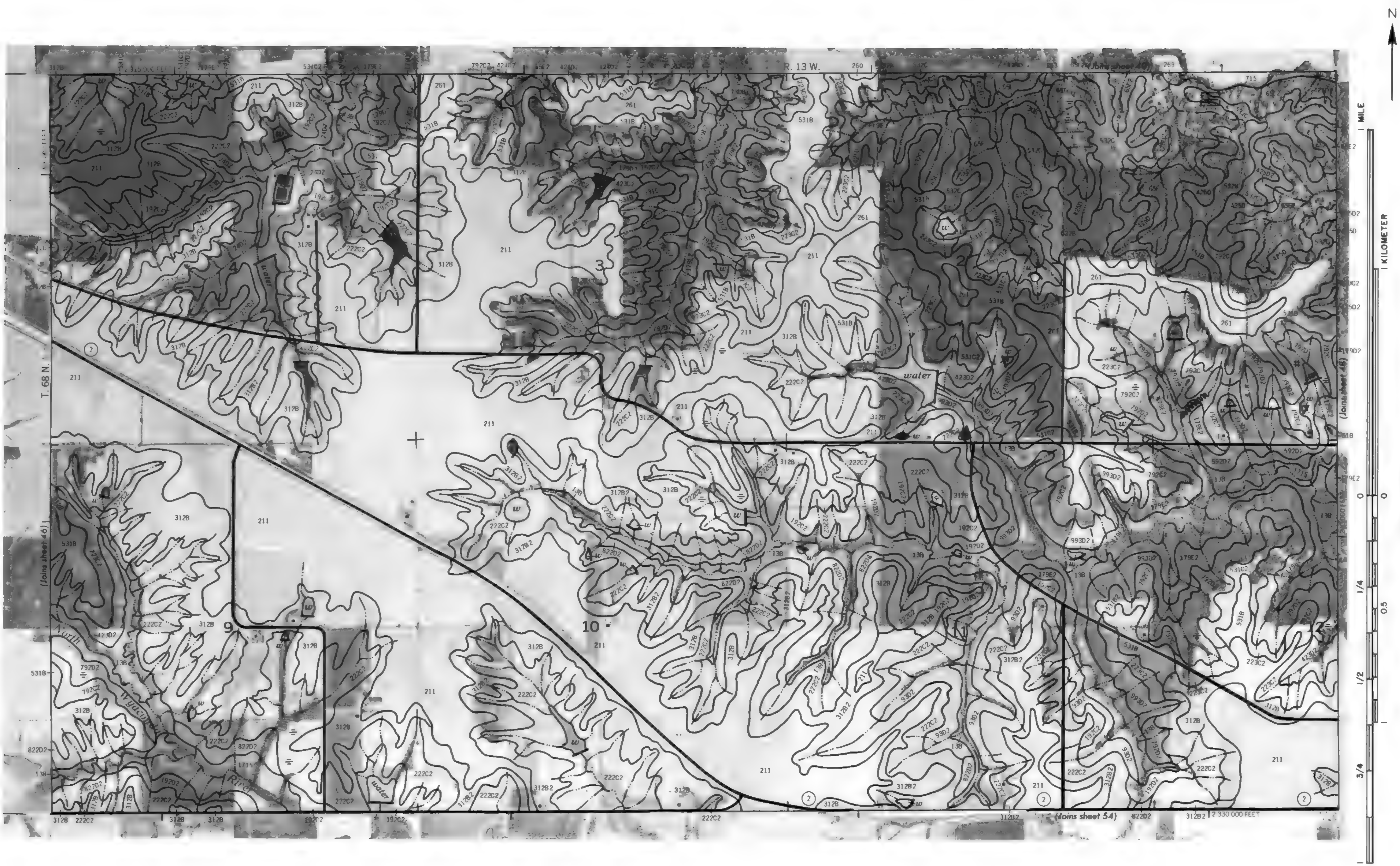
Scale 1:15 840

SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 46



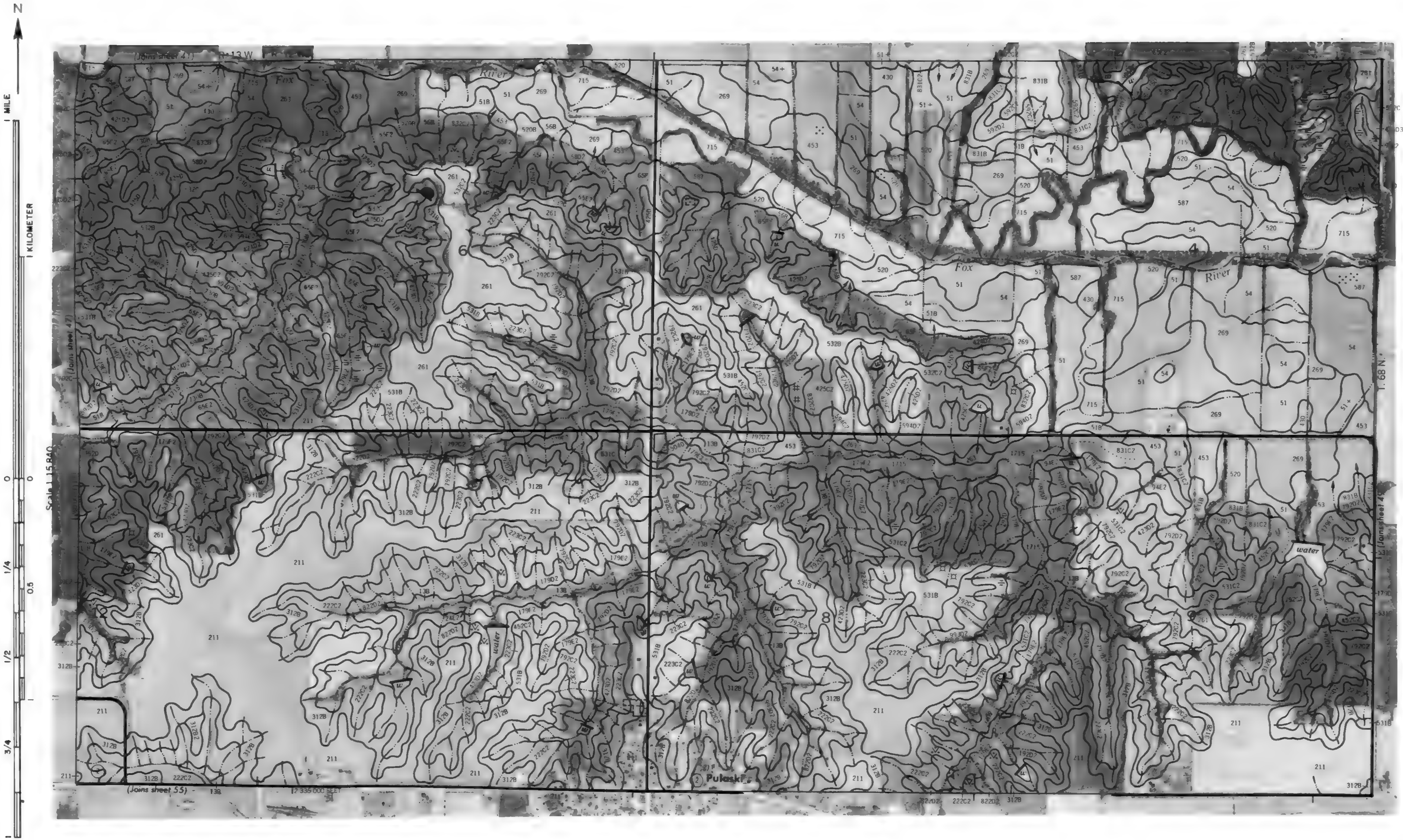
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

47

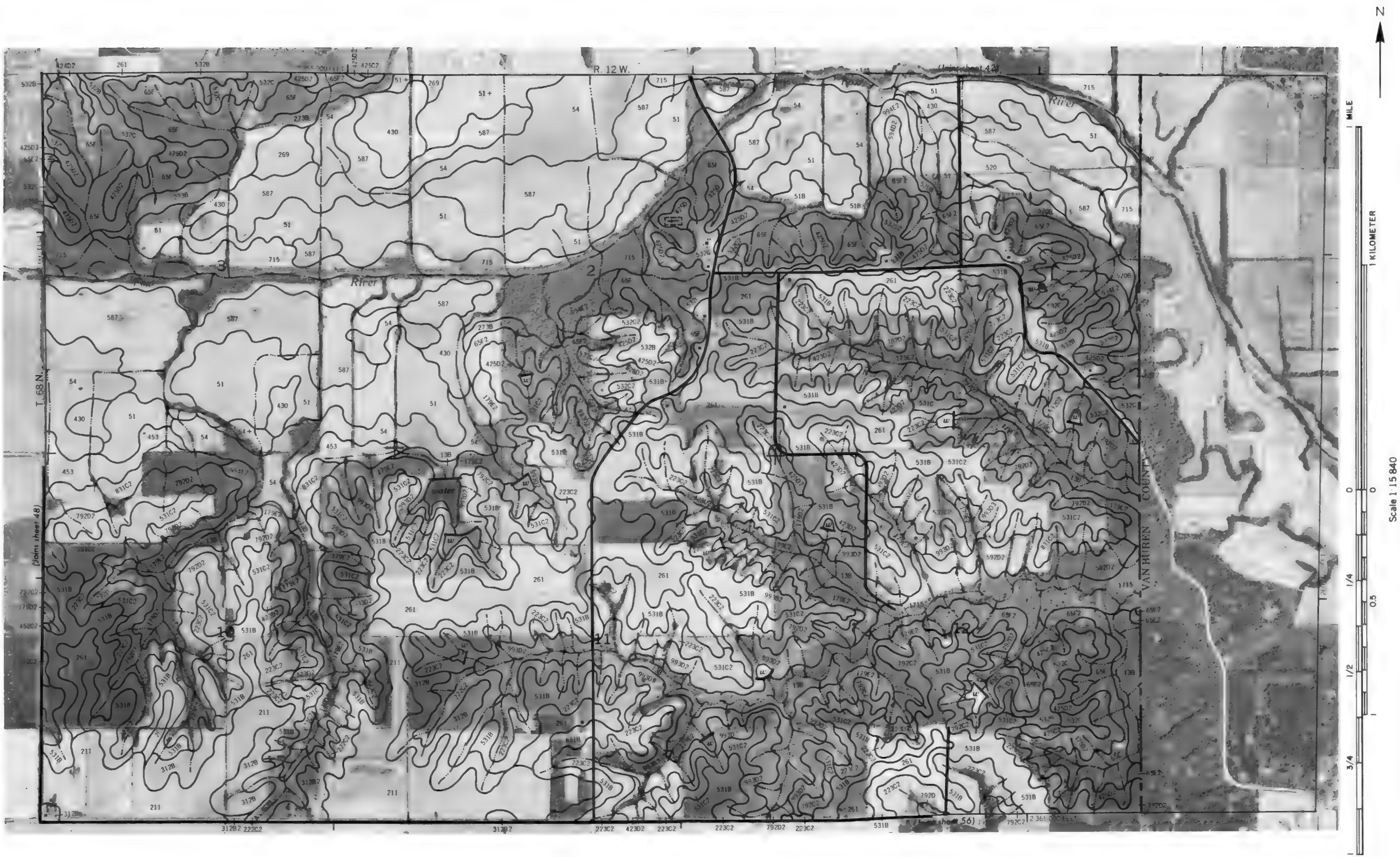


DAVIS COUNTY, IOWA NO. 47

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



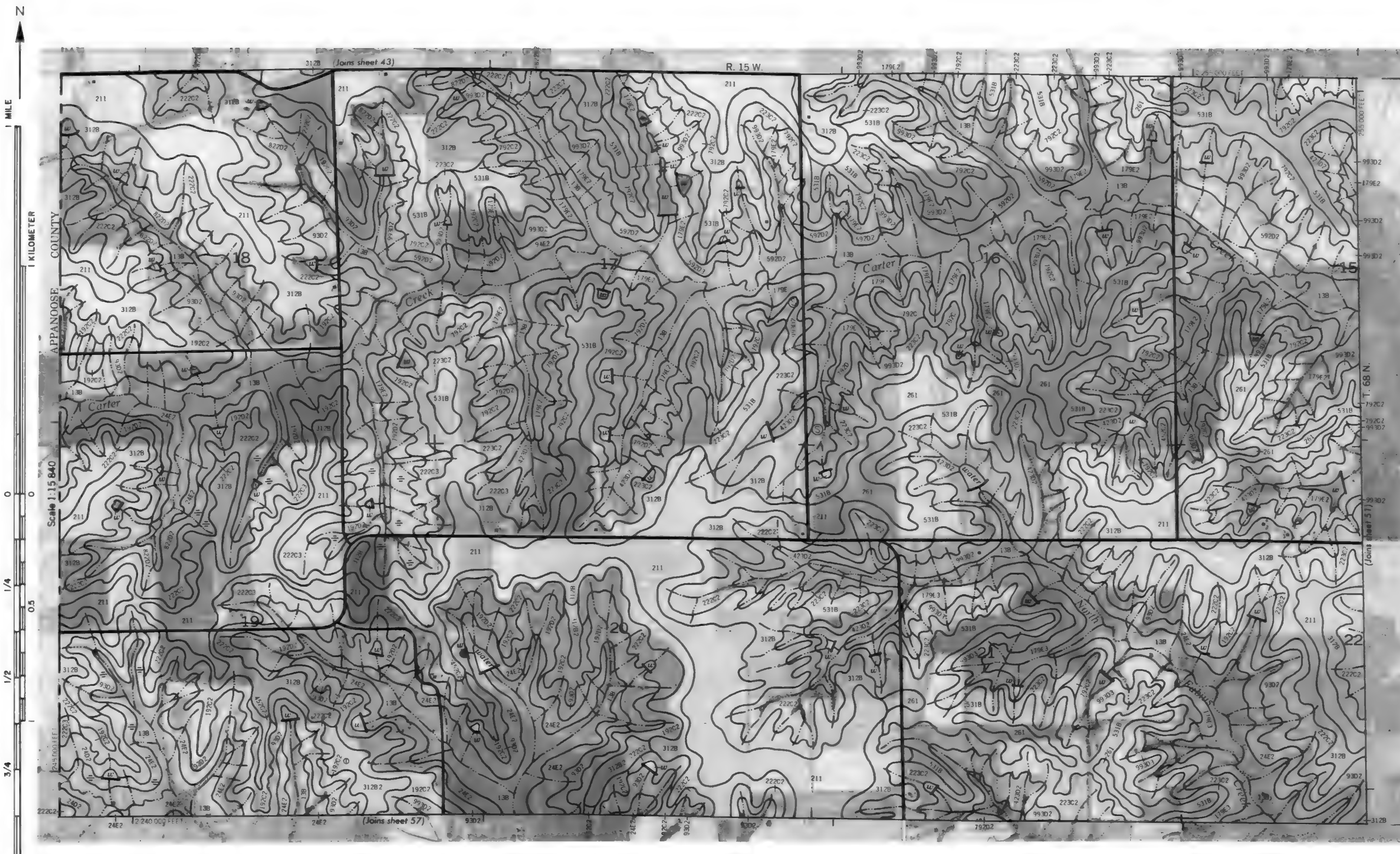
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



DAVIS COUNTY, IOWA NO. 49

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

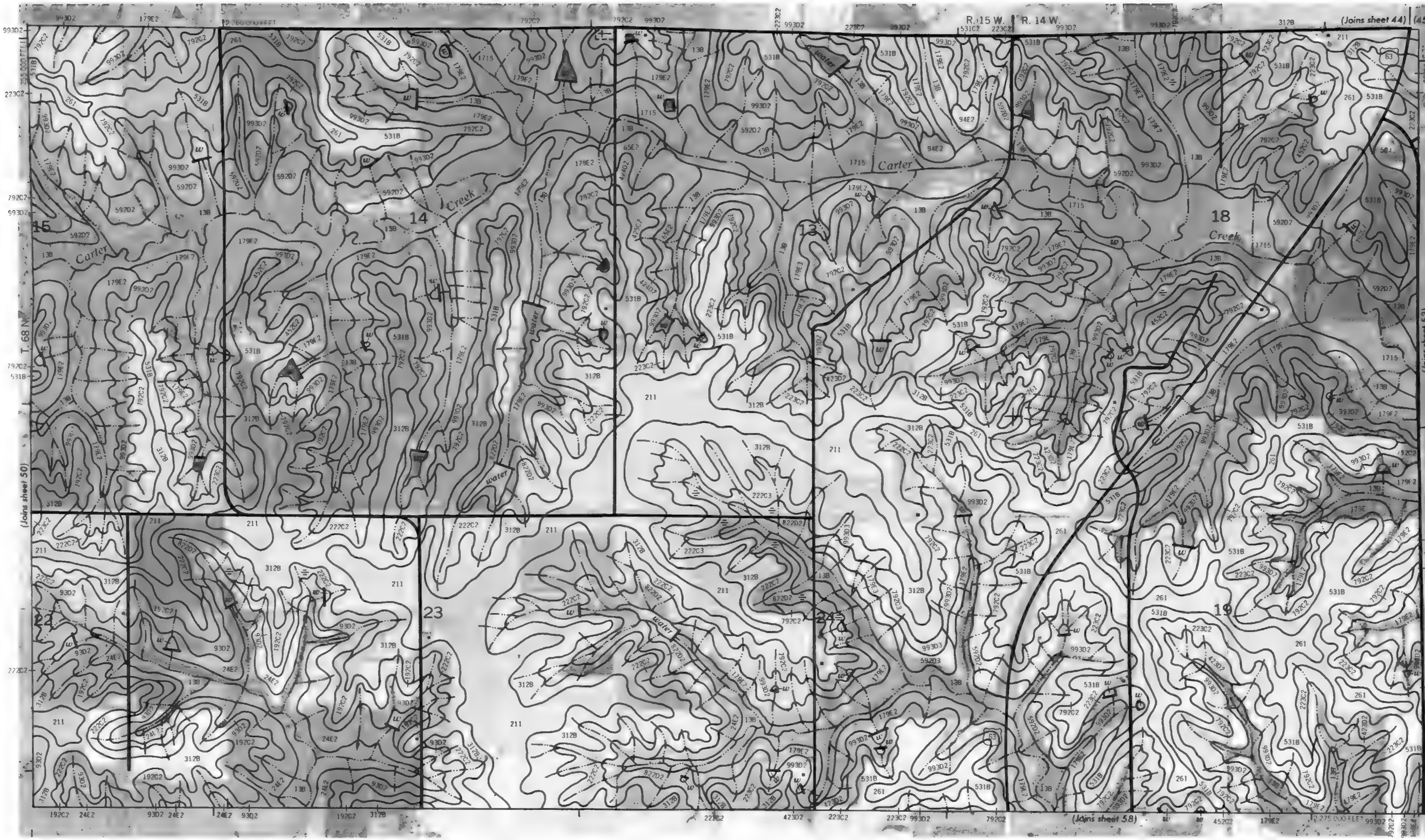
SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 50



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

51

N



1 MILE

1 KILOMETER

0 1/4 1/2 3/4

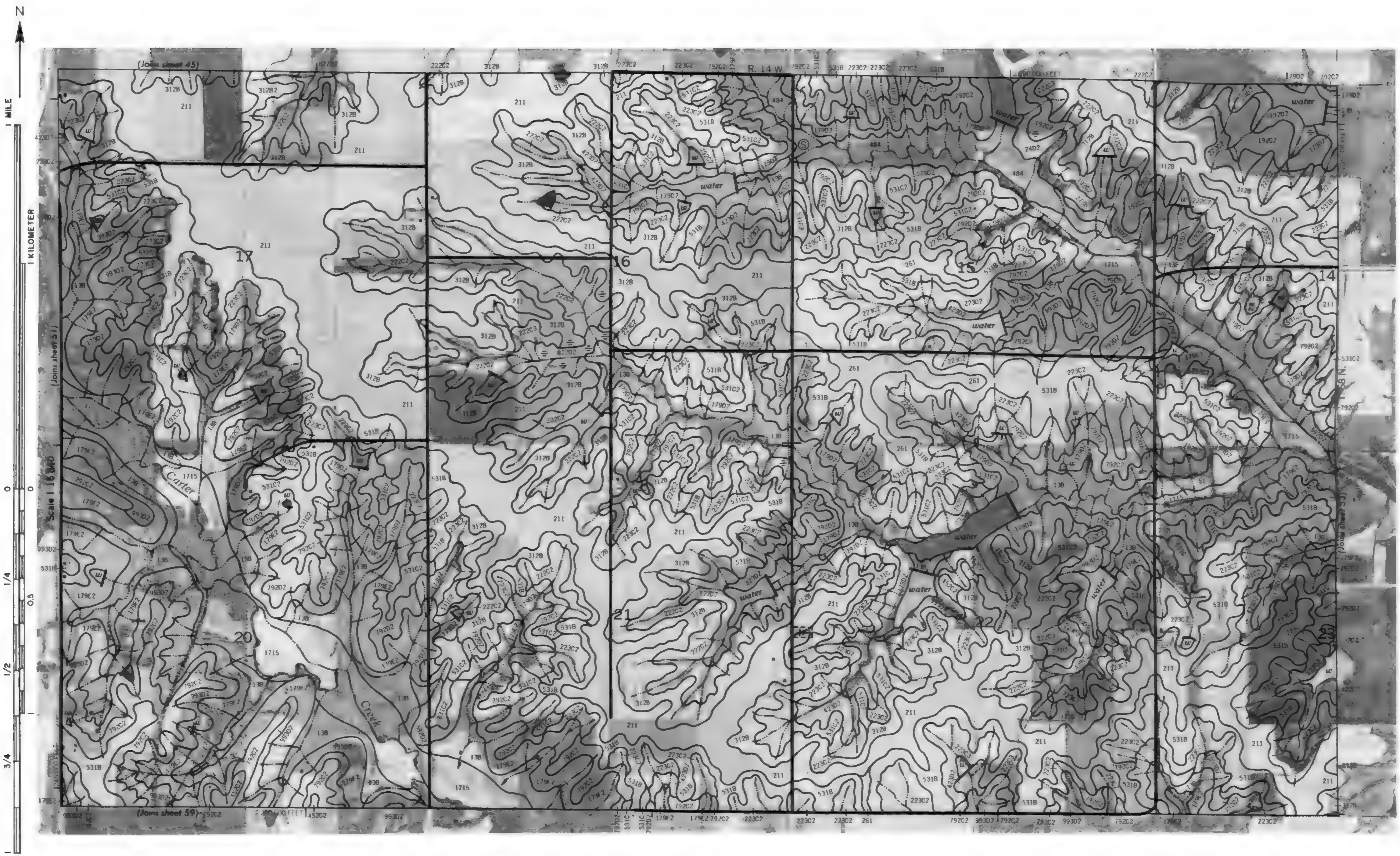
0 0.5

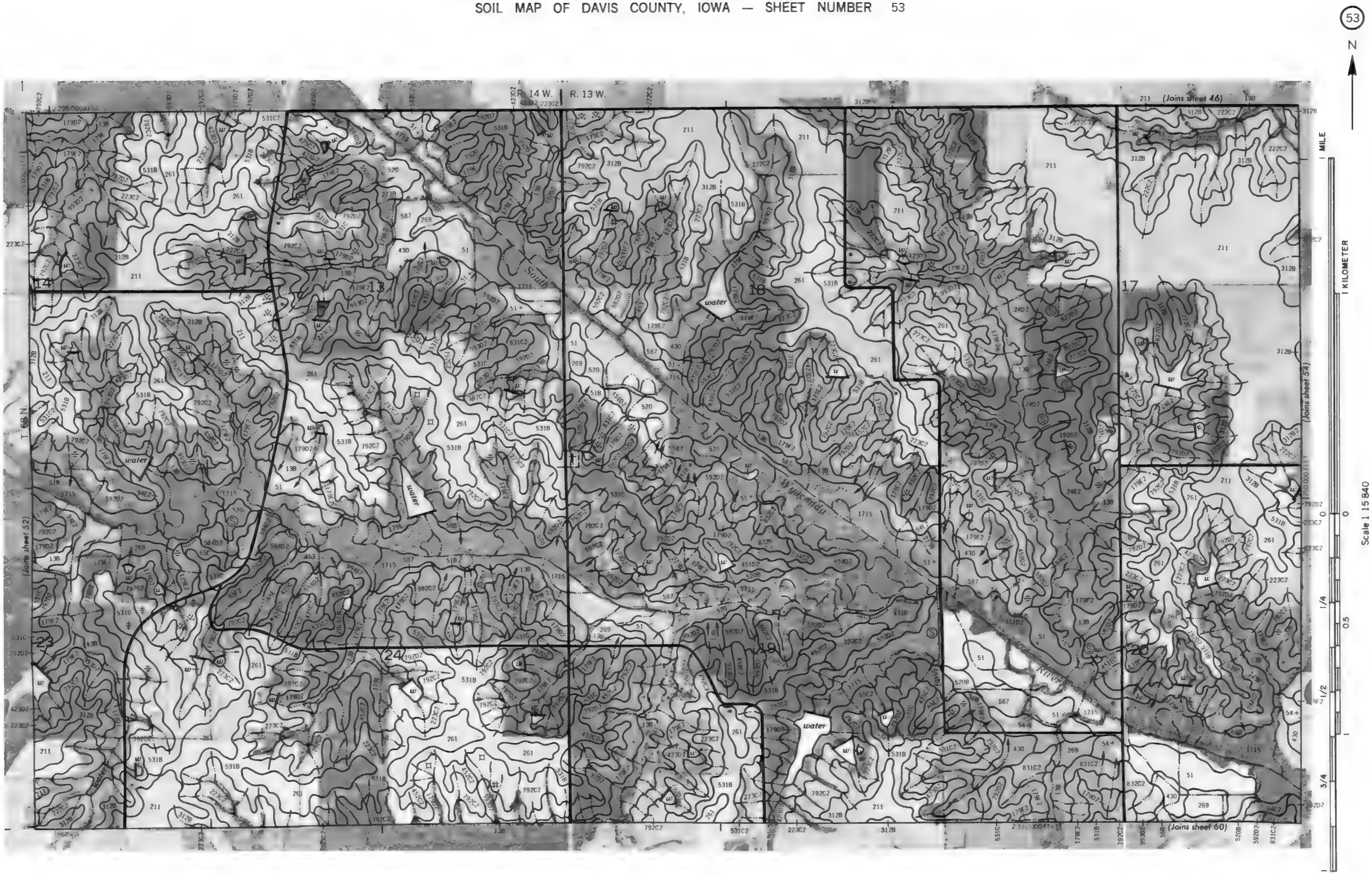
Scale 1:15 840

DAVIS COUNTY, IOWA NO. 51

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

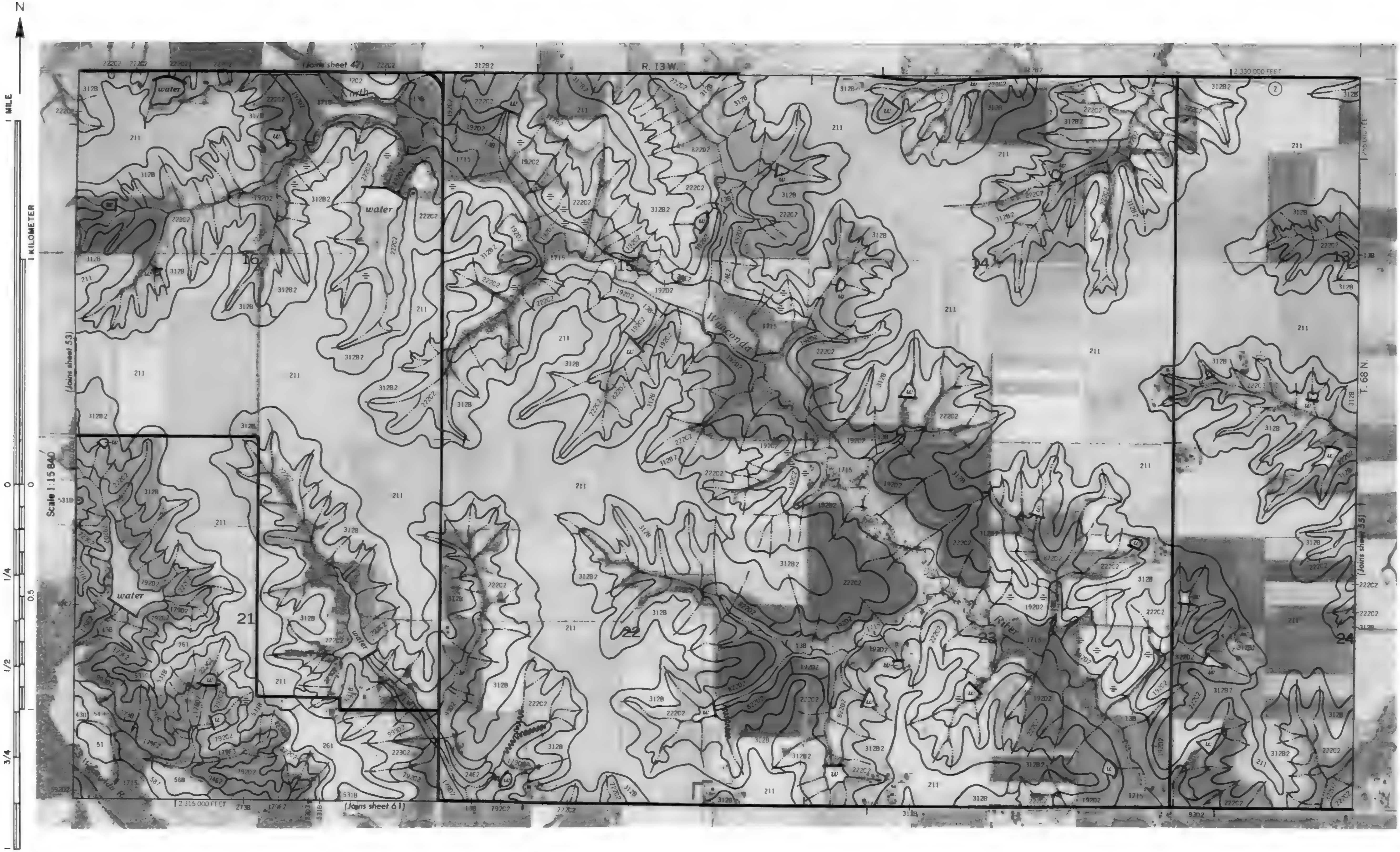
SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 52





DAVIS COUNTY, IOWA NO. 53

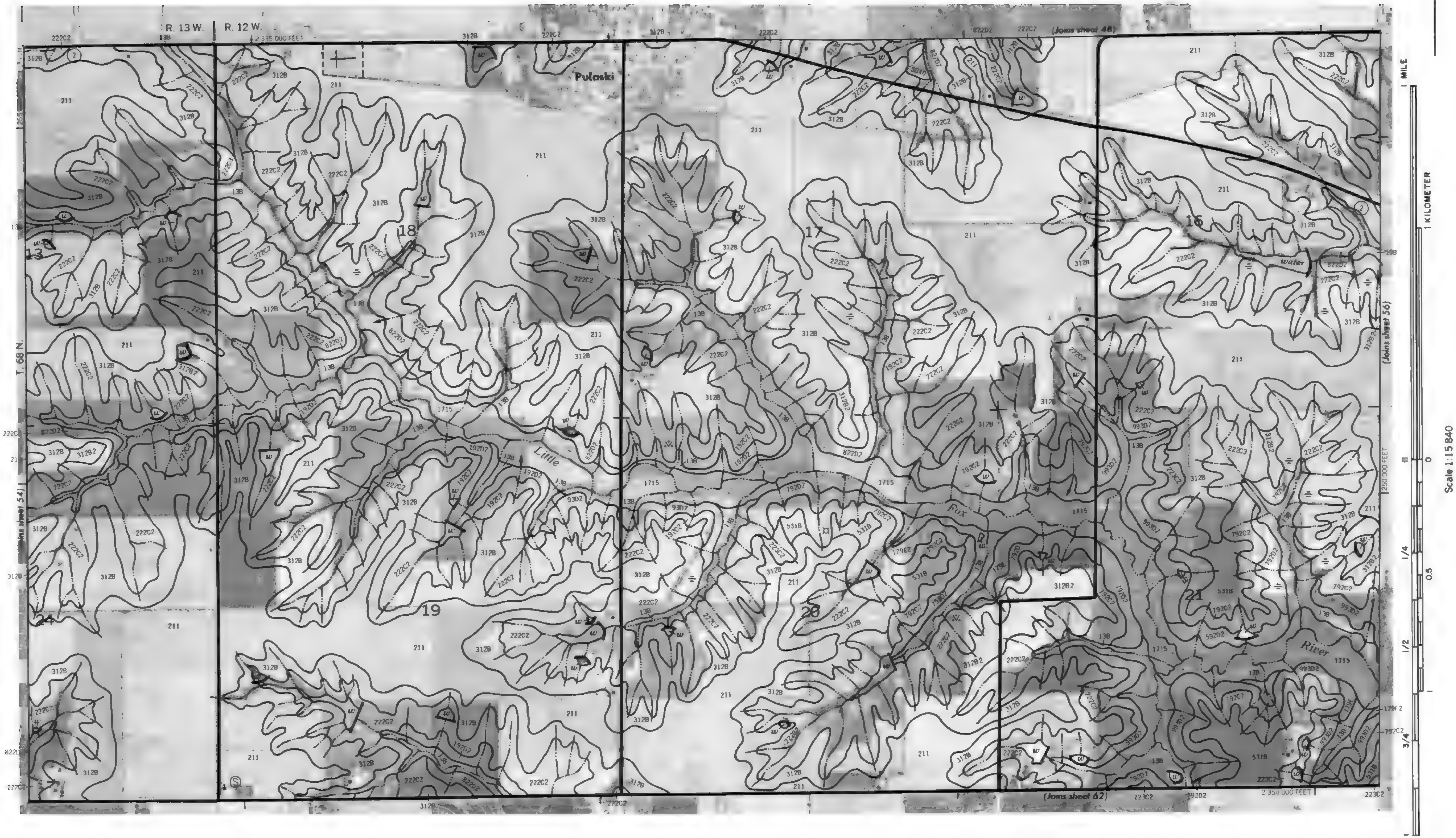
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

DAVIS COUNTY, IOWA NO. 55

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned



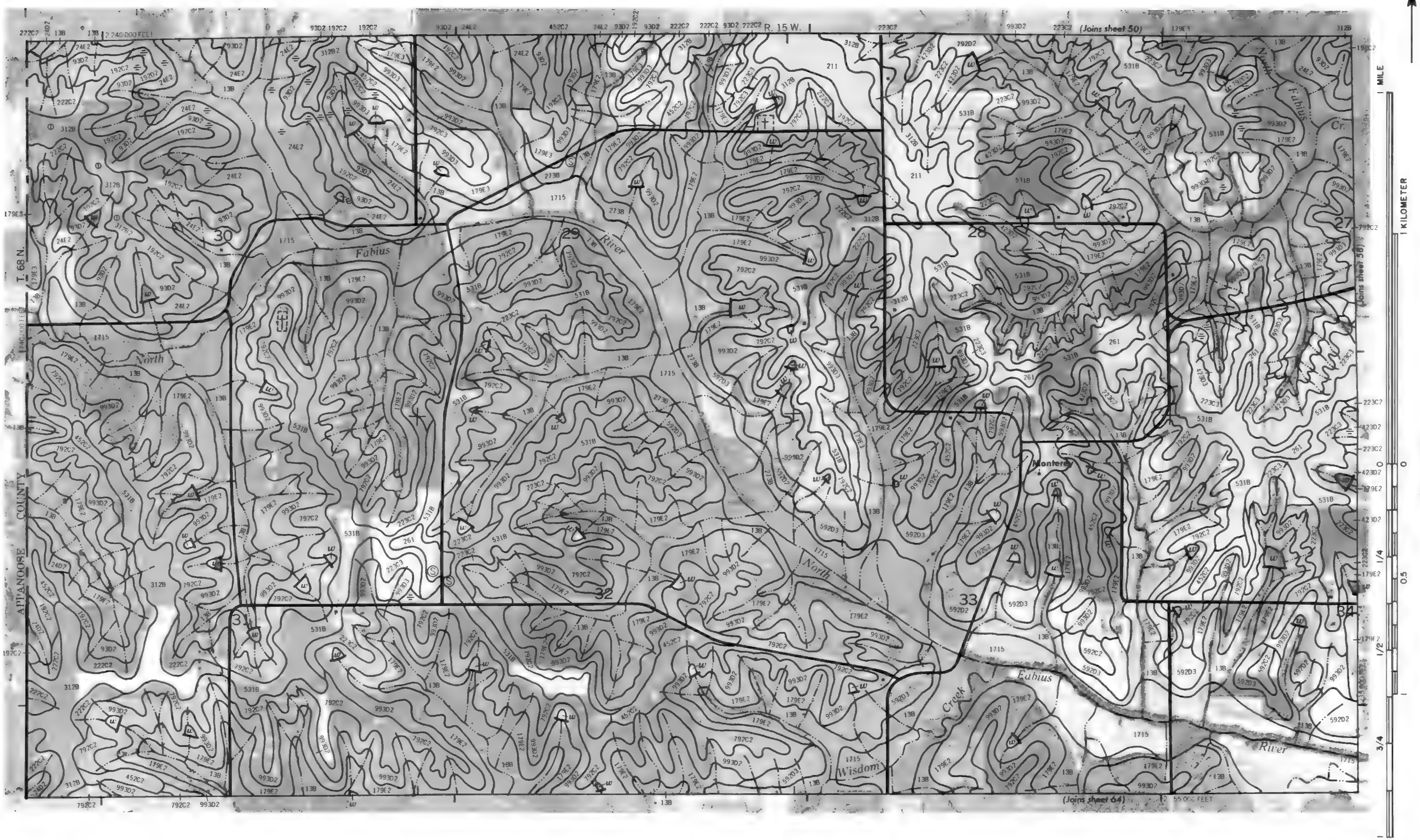
SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 56

DAVIS COUNTY, IOWA NO. 56

57

DAVIS COUNTY, IOWA NO. 57

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



N

1 MILE

1 KILOMETER

Scale 1:15 840

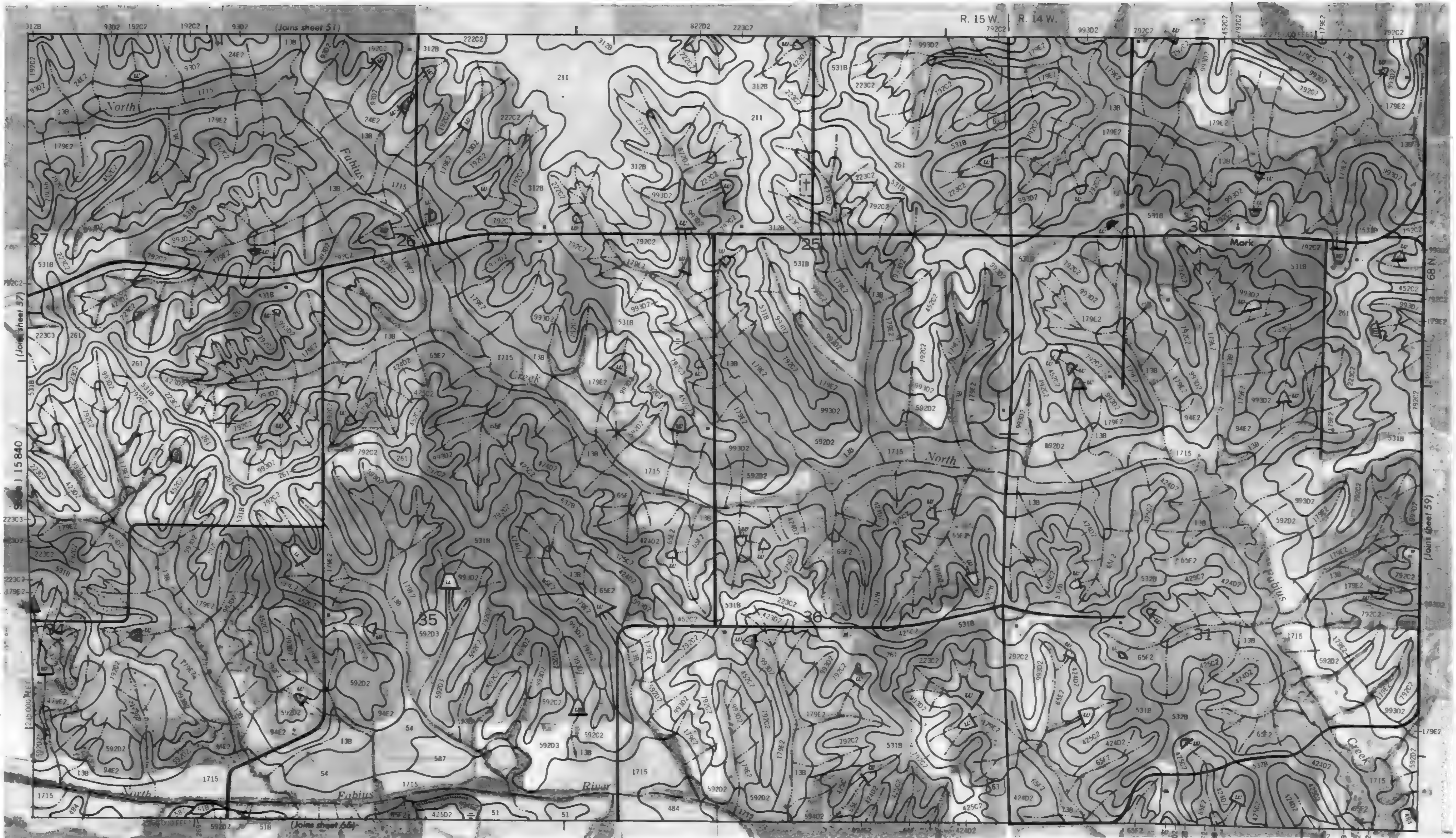
0

1/4

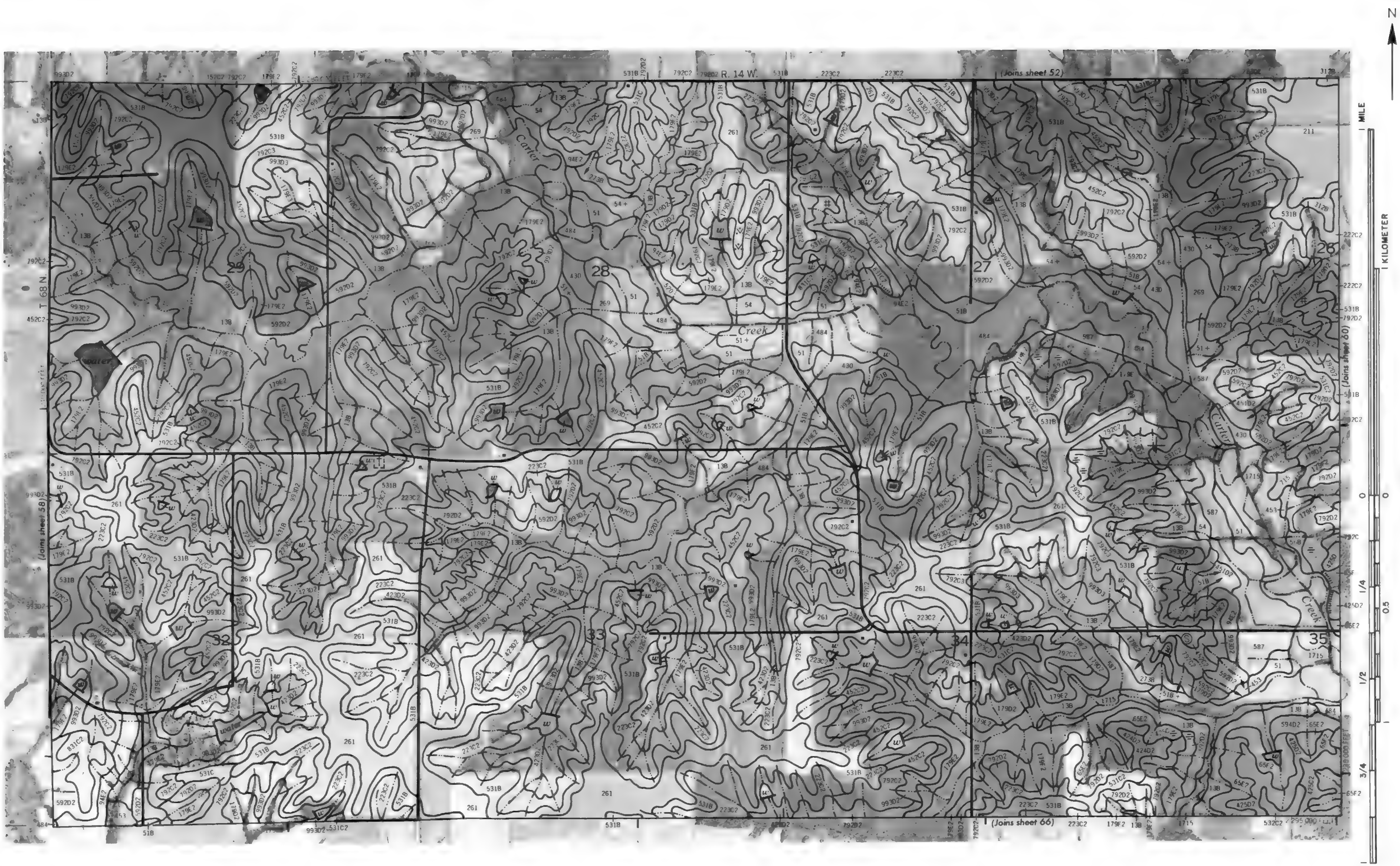
0.5

1/2

3/4



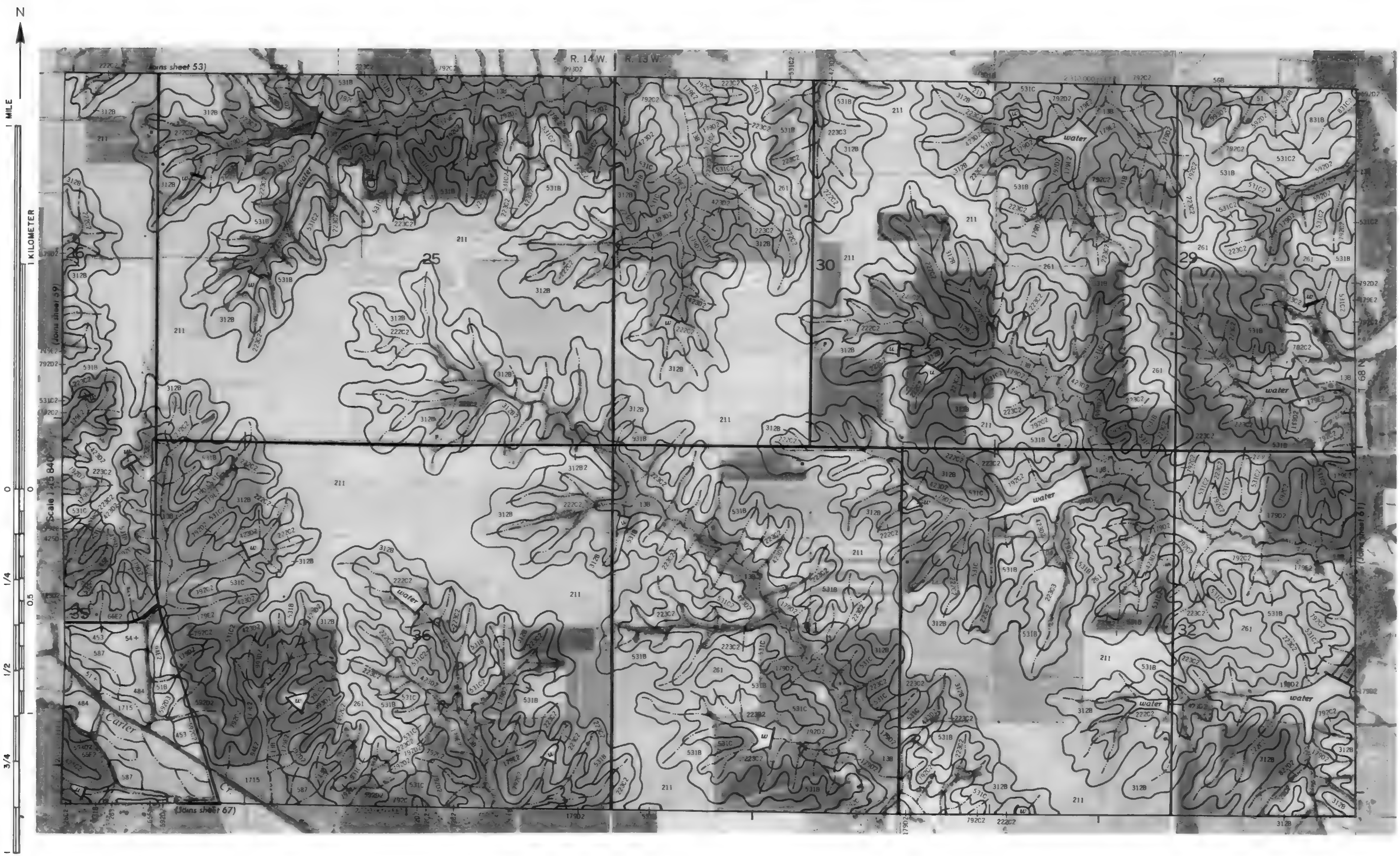
DAVIS COUNTY, IOWA NO. 58



DAVIS COUNTY, IOWA NO. 59

The soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

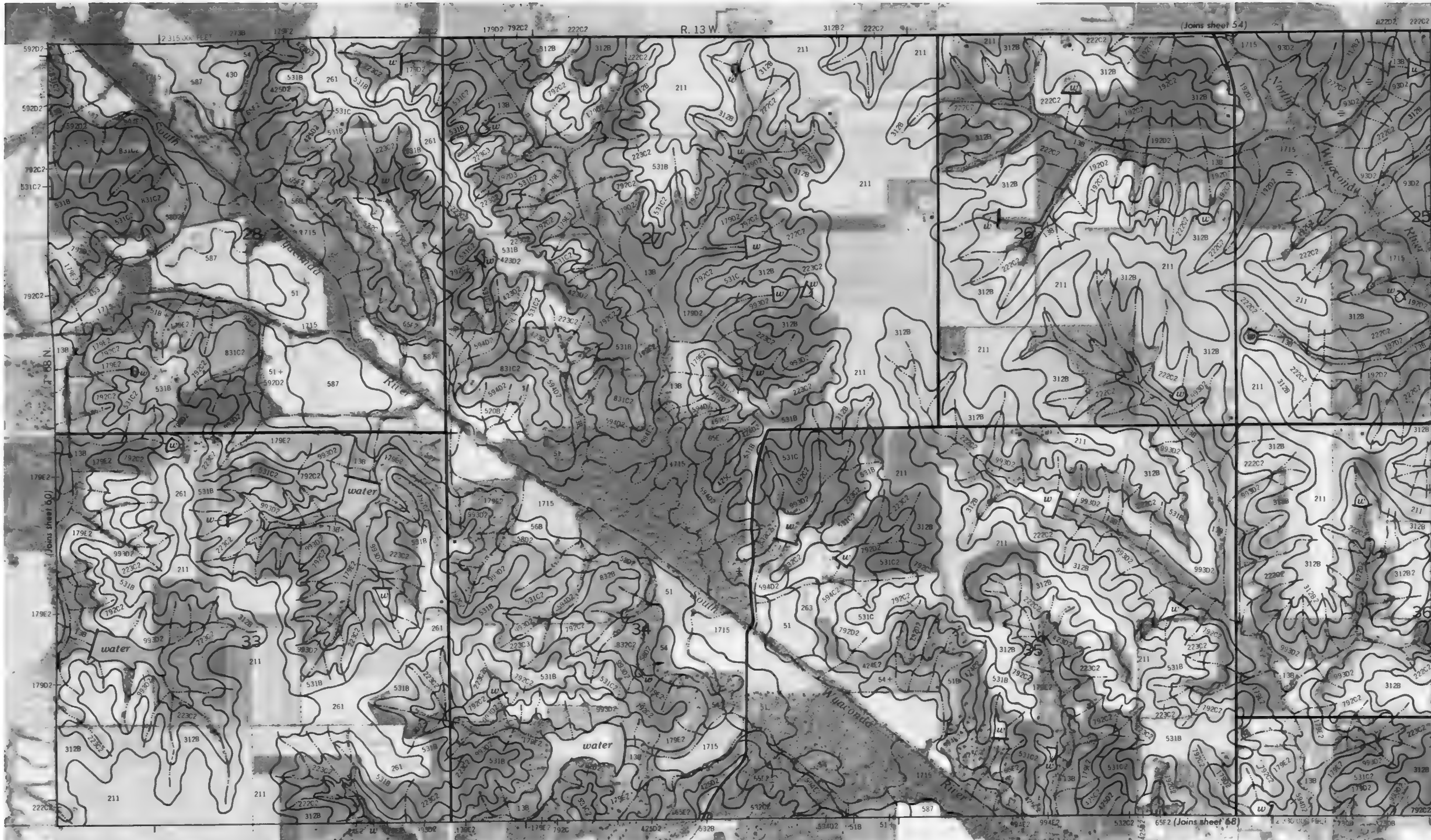
SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 60



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

DAVIS COUNTY, IOWA NO. 60

N



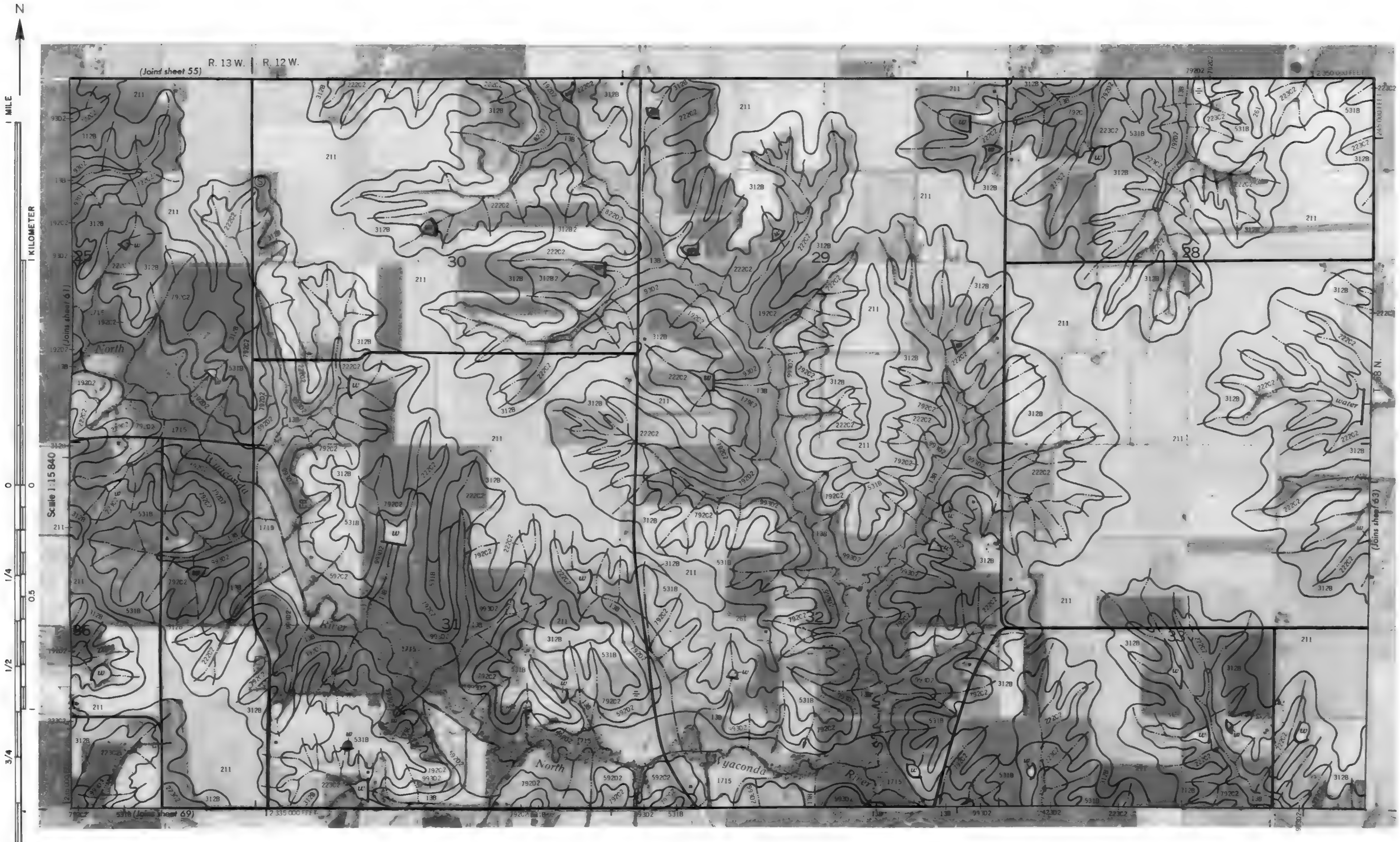
1 MILE

1 KILOMETER

Scale 1:15 840

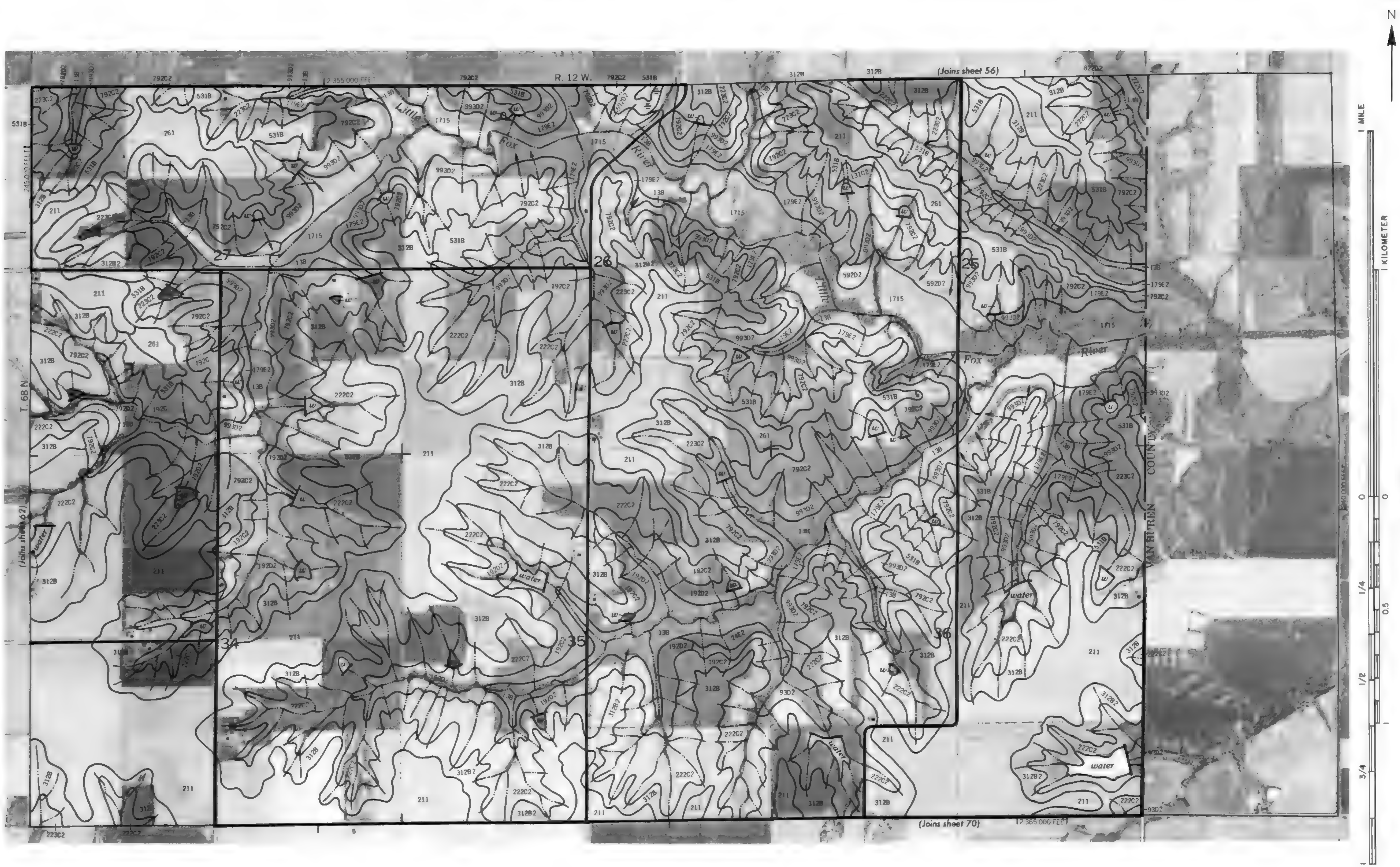
DAVIS COUNTY, IOWA NO. 61

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

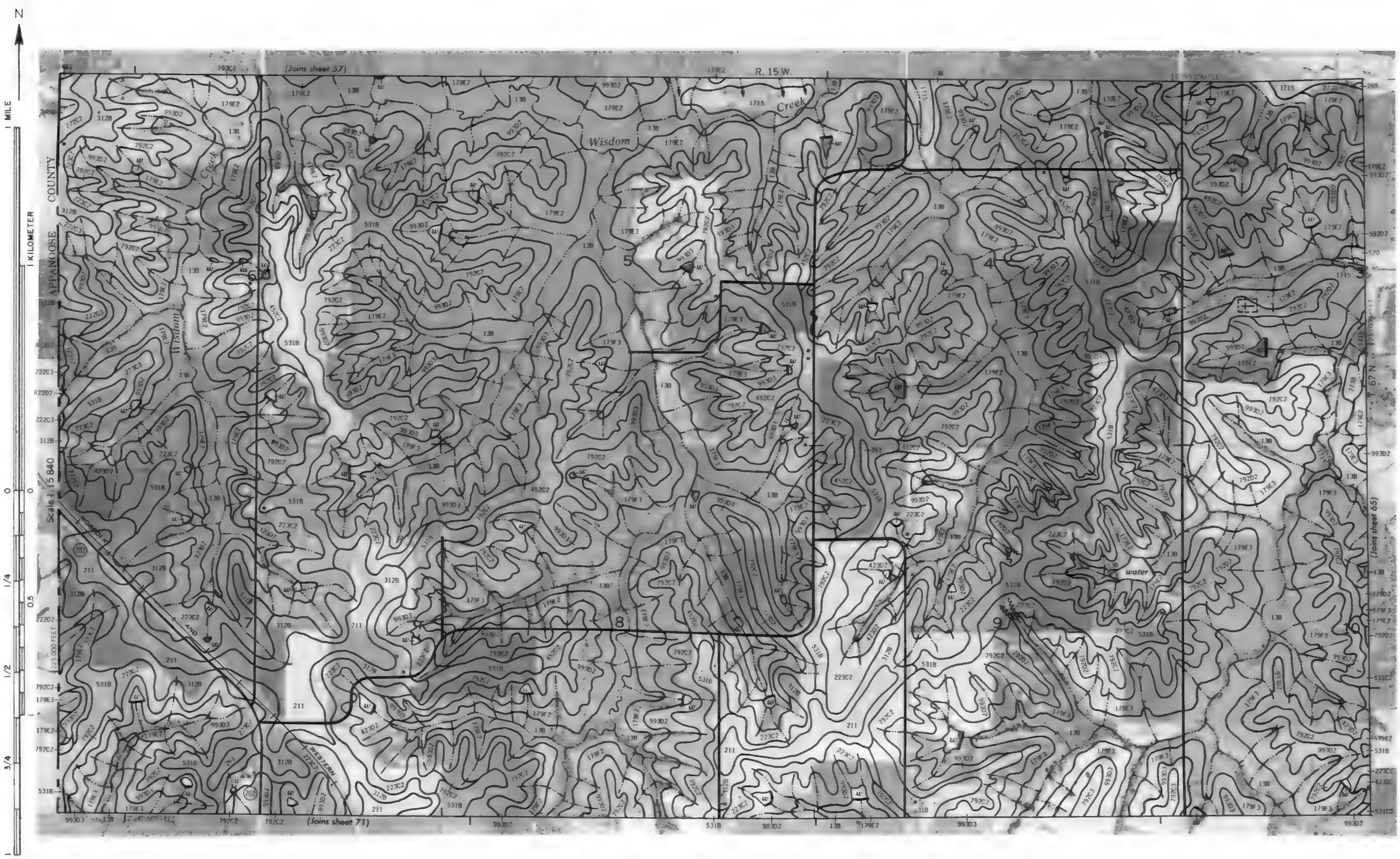
DAVIS COUNTY, IOWA NO. 62



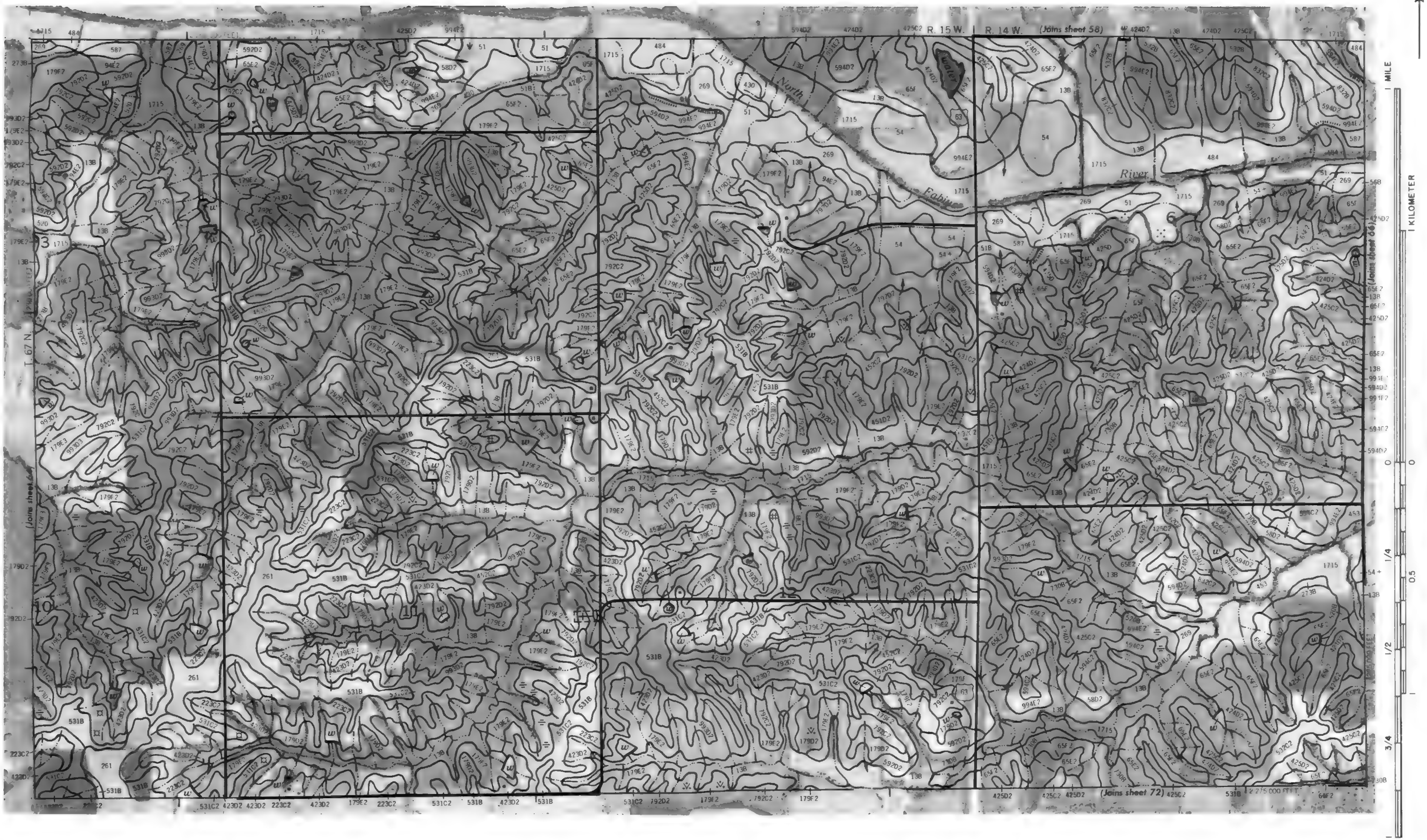
DAVIS COUNTY, IOWA NO. 63

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

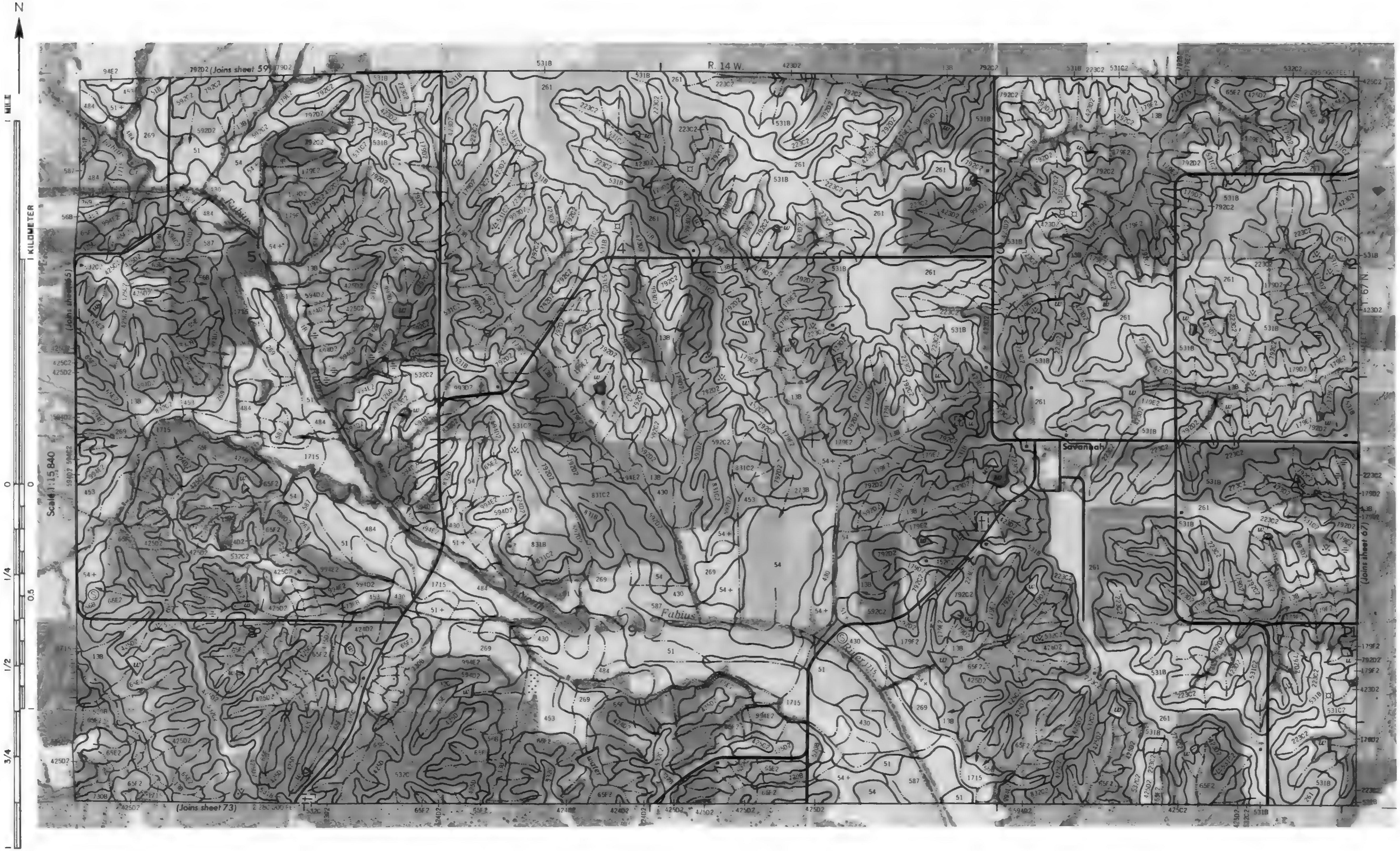
SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 64



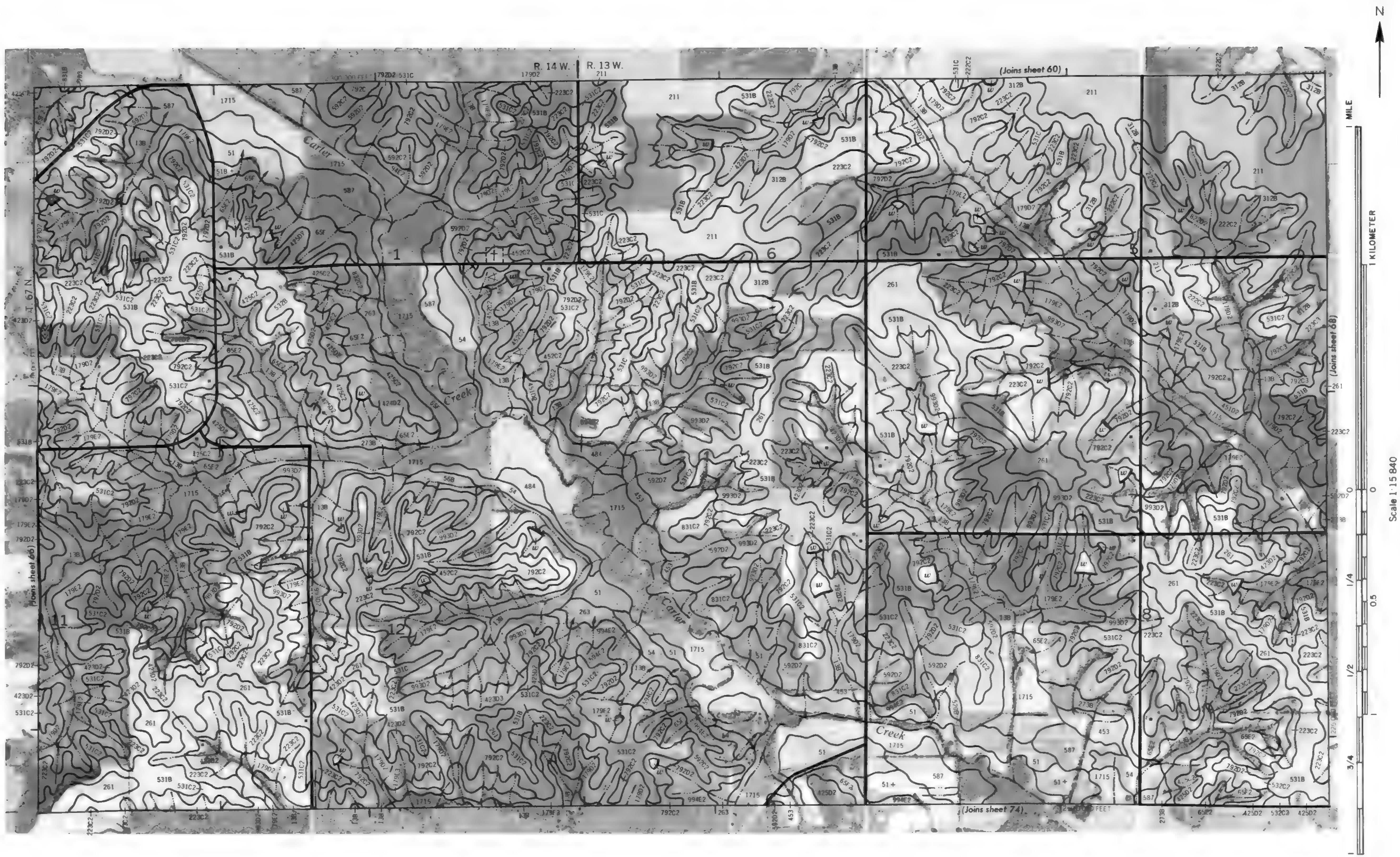
DAVIS COUNTY, IOWA NO. 65



SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 66



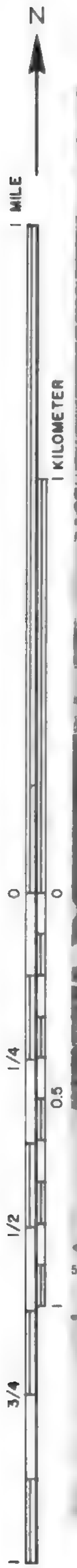
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

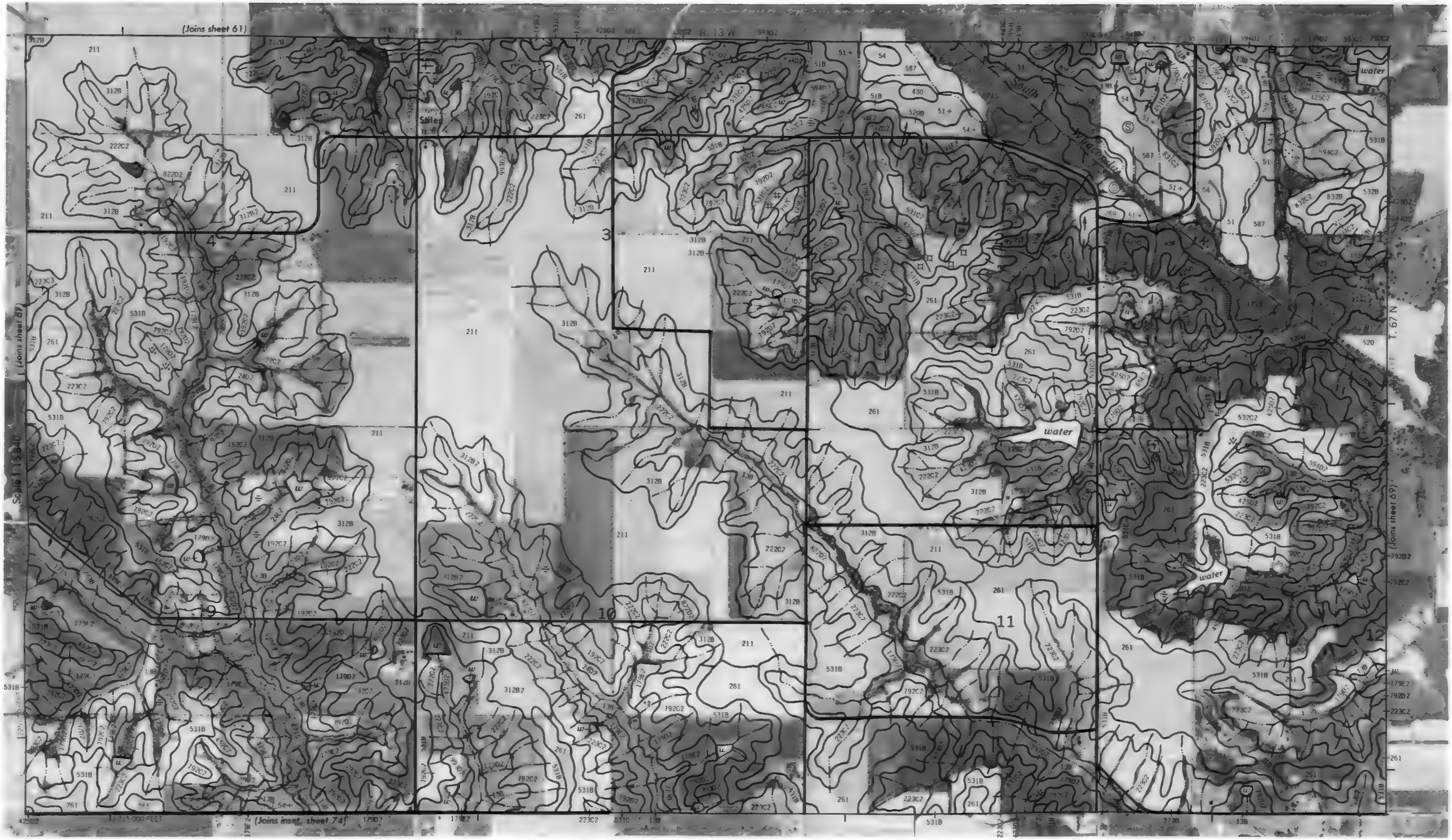


DAVIS COUNTY, IOWA NO. 67

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

68

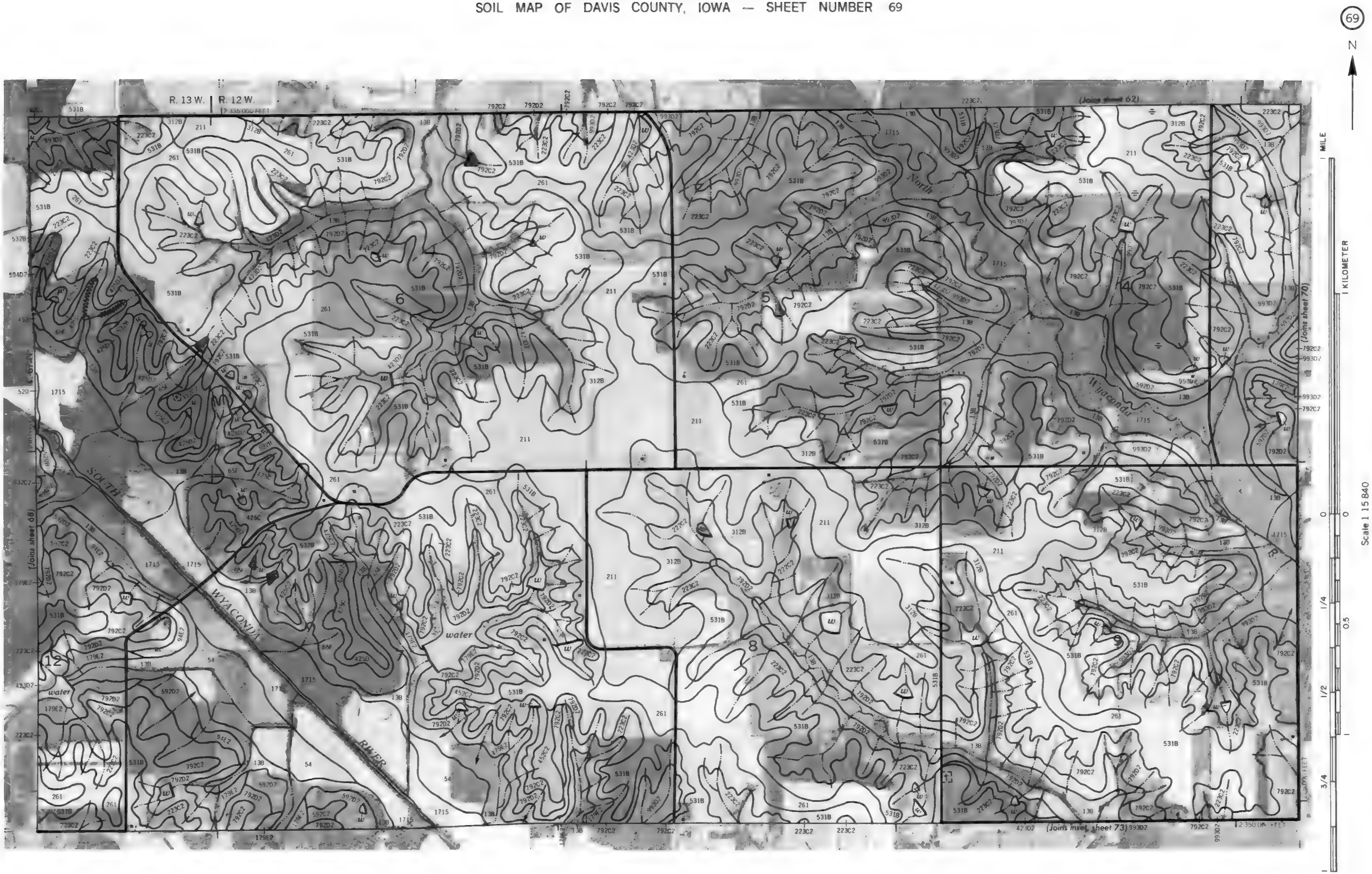




This soil survey map is compiled on 1979 aerial photographs by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

DAVIS COUNTY, IOWA NO. 68

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 70

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

71

N

DAVIS COUNTY, IOWA NO. 71

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners if shown, are approximately positioned

1 MILE

1 KILOMETER

0 1/4 1/2 3/4

0 0.5

Scale 1:15 840

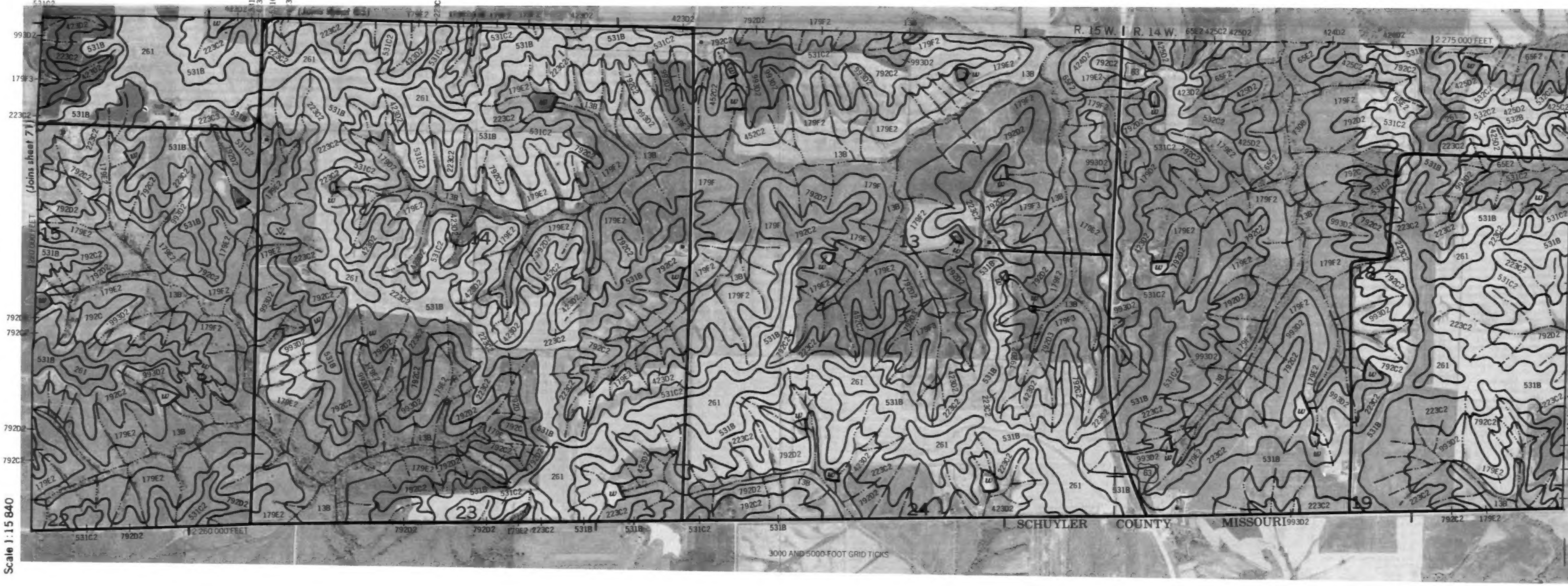
SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 72

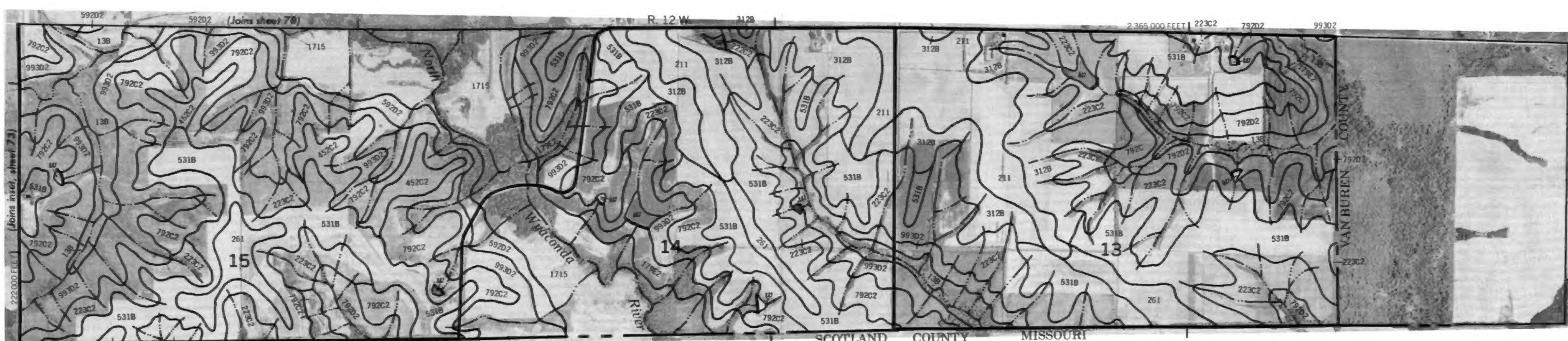
N

MILE 0 1/4 1/2 3/4 1

KILOMETER 0 0.5 1

Scale 1:15 840

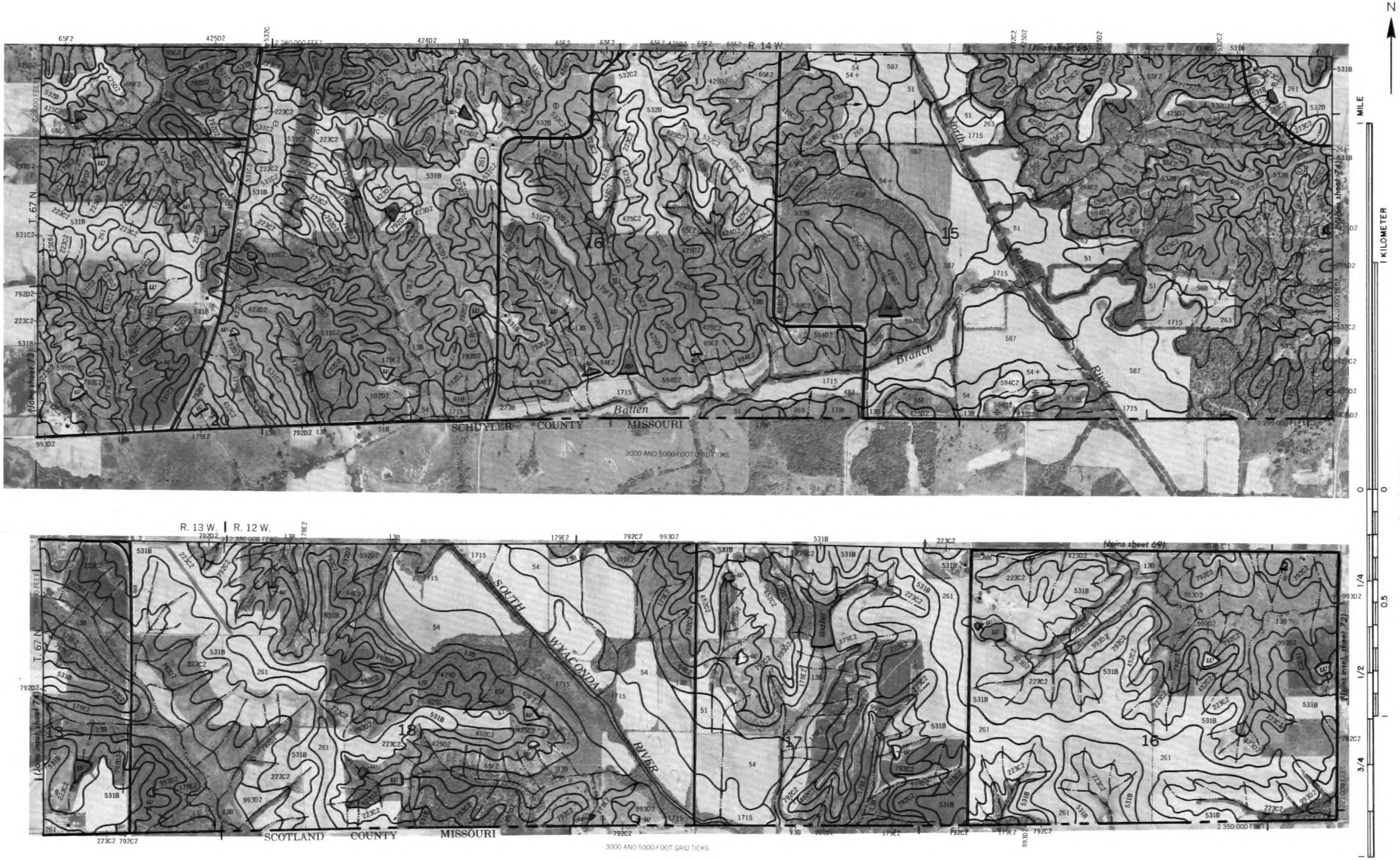




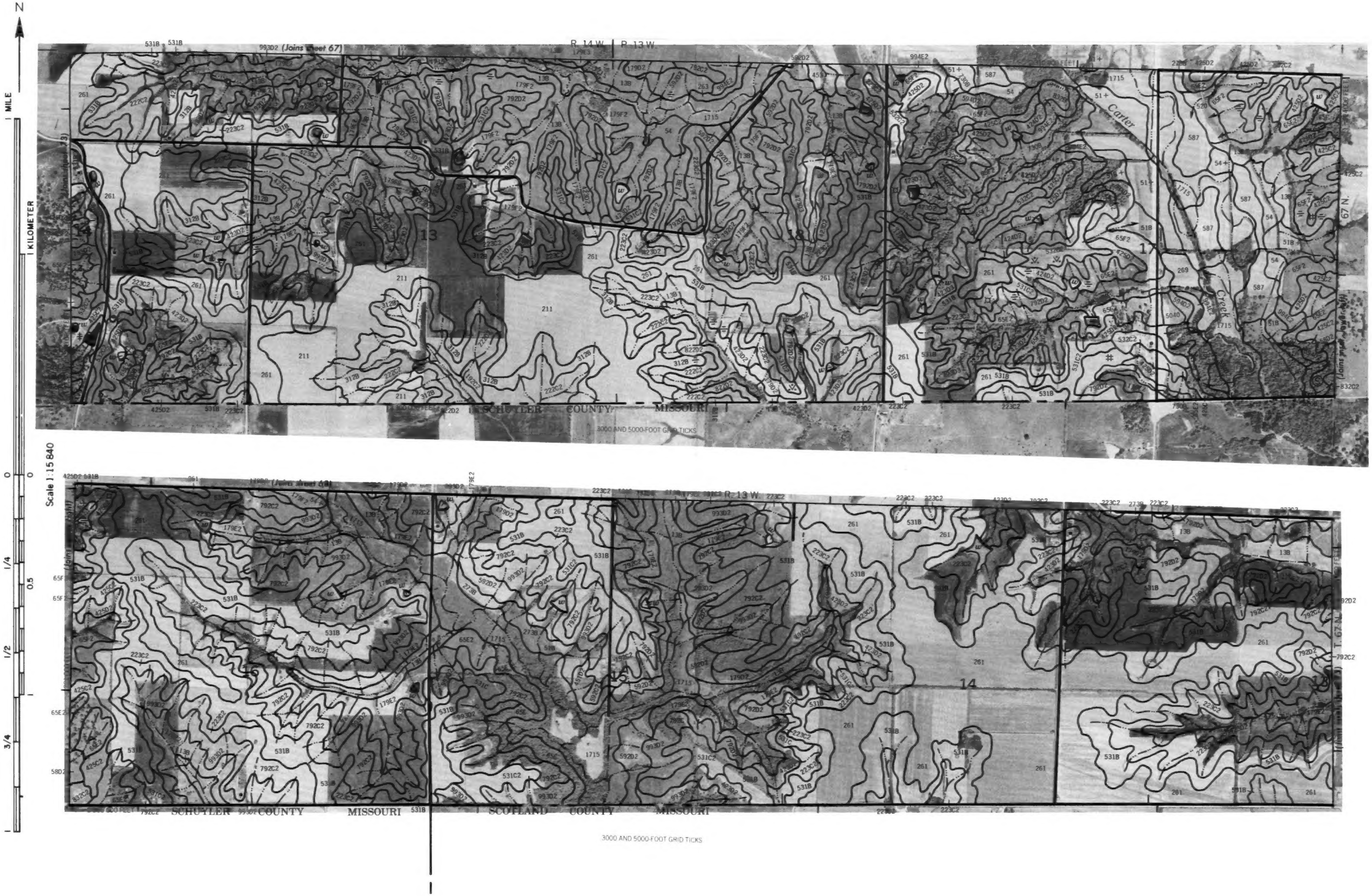
This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

DAVIS COUNTY, IOWA NO. 73

This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



SOIL MAP OF DAVIS COUNTY, IOWA — SHEET NUMBER 74



This soil survey map is compiled on 1979 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.